

PCT/US2004/010582

REC'D 22 JUN 2005

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P2 1320744

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

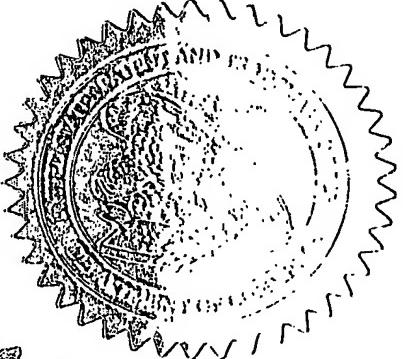
UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office

June 17, 2005

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY OF THE BELOW IDENTIFIED INTERNATIONAL APPLICATION AS ORIGINALLY FILED AND ANY CORRECTIONS THERETO FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE ACTING AS A RECEIVING OFFICE UNDER THE PATENT COOPERATION TREATY.

APPLICATION NUMBER: PCT/US04/06308  
FILING DATE: March 02, 2004

By Authority of the  
COMMISSIONER OF PATENTS AND TRADEMARKS

  
H. L. JACKSON  
Certifying Officer

PCT/US04/06308

TRANSMITTAL LETTER TO THE  
UNITED STATES RECEIVING OFFICE

Date	2 March 2004
International Application No.	PCT/US04/06308
Attorney Docket No.	PROL-PWO-024

## I. Certificate under 37 CFR 1.10 (if applicable)

EV323 524 199US
Express Mail mailing number

2 March 2004
Date of Deposit

I hereby certify that the application/correspondence attached hereto is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to MS PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

*Maura A. Gallagher*

Signature of person mailing correspondence

*Maura A. Gallagher*

Typed or printed name of person mailing correspondence

II.  New International Application

TITLE	POSH INTERACTING PROTEINS AND RELATED METHODS	Earliest priority date (Day/Month/Year)
		03/03/03

**SCREENING DISCLOSURE INFORMATION:** In order to assist in screening the accompanying international application for purposes of determining whether a license for foreign transmittal should and could be granted and for other purposes, the following information is supplied. (Note: check as many boxes as apply):

- A.  The invention disclosed was not made in the United States.
- B.  There is no prior U.S. application relating to this invention.
- C.  The following prior U.S. application(s) contain subject matter which is related to the invention disclosed in the attached international application. (NOTE: priority to these applications may or may not be claimed on form PCT/RO/101 (Request) and this listing does not constitute a claim for priority.)

App No	App No
App No 60/451,437 filed 3 March 2003	App No 60/479,317 filed 17 June 2003
App No 60/452,284 filed 5 March 2003	App No 60/480,376 filed 19 June 2003
App No 60/456,640 filed 20 March 2003	App No 60/480,215 filed 19 June 2003
App No 60/460,526 filed 3 April 2003	App No 60/493,860 filed 8 August 2003
App No 60/464,285 filed 21 April 2003	App No 60/503,931 filed 16 September 2003
App No 60/469,462 filed 9 May 2003	App No 60/455,760 filed 19 March 2003
App No 60/471,378 filed 15 May 2003	App No 60/460,792 filed 4 April 2003
App No 60/472,327 filed 20 May 2003	App No 60/498,634 filed 28 August 2003
App No 60/474,706 filed 30 May 2003	App No US03/35712 filed 10 November 2003
App No A PCT application filed on February 5, 2004 (Attorney Docket No. PROL-PWO-039), in the name of Iris Alroy, Daniel Taglicht, Yuval Reiss, Liora Yaar, and Shmuel Tuvia entitled "Posh Associated Kinases and Related Methods."	App No A provisional application filed on March 2, 2004, (Attorney Docket No. PROL-P79-024), in the name of Daniel N. Taglicht, Iris Alroy, Yuval Reiss, Liora Yaar, Danny Ben-Avraham, Shmuel Tuvia and Tsvika Greener entitled "Posh Interacting Proteins and Related Methods."

- D.  The present international application  contains additional subject matter not found in the prior U.S. application(s) identified in paragraph C. above. The additional subject matter is found on pages **THROUGHOUT** and  **DOES NOT ALTER**  **MIGHT BE CONSIDERED TO ALTER** the general nature of the invention in a manner which would require the U.S. application to have been made available for inspection by the appropriate defense agencies under 35 U.S.C. 181 and 37 CFR 5.1. See 37 CFR 5.15.

IV.  A Request for Rectification under PCT Rule 91       A Petition       A Sequence Listing Diskette

V.  Other (please specify): Request & Fee Calculation Sheet (7 pp); Description (155 pp); Claims (16 pp); Abstract (1 p); Drawings (202 pp); Return postcard from RO/US confirming receipt of PCT application

The person signing this form is the:	<input type="checkbox"/> Applicant	Kathleen Ehrhard
	<input checked="" type="checkbox"/> Attorney/Agent Reg. No. P-55,144	Typed name of signer
	<input type="checkbox"/> Common Representative	<i>Kathleen Ehrhard</i> Signature

HOME COPY

**PCT****REQUEST**

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only	
<b>PCT/US 04/06308</b>	
International Application No.	
International Filing Date 02 MAR 2004 (02.03.04)	
<b>PCT INTERNATIONAL</b> Name of receiving Office and "PCT International Application"	
Applicant's file reference PROL-PWO-024 (if desired) (12 characters maximum)	

**Box No. I TITLE OF INVENTION**

POSH INTERACTING PROTEINS AND RELATED METHODS

**Box No. II APPLICANT** This person is also inventor

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

PROTEOLOGICS, INC.  
40 Ramland Road South  
Suite 10  
Orangeburg, New York 10962  
United States of America

Telephone No.

Facsimile No.

Teleprinter No.

Applicant's registration No. with the Office

State (that is, country) of nationality:  
USState (that is, country) of residence:  
US

This person is applicant  all designated  all designated States except  the United States of America  the United States of America only  the States indicated in the Supplemental Box  
for the purposes of:  States

**Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)**

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

TAGLICHT, Daniel N.  
Lapid  
Israel

This person is:

- applicant only
- applicant and inventor
- inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
ILState (that is, country) of residence:  
IL

This person is applicant  all designated  all designated States except  the United States of America  the United States of America only  the States indicated in the Supplemental Box  
for the purposes of:  States

 Further applicants and/or (further) inventors are indicated on a continuation sheet.**Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE**

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

agent  common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

EHRHARD, Kathleen  
Ropes & Gray LLP  
One International Place  
Boston, Massachusetts 02110-2624  
United States of America

Telephone No.  
(617) 951-7037Facsimile No.  
(617) 951-7050

Teleprinter No.

Agent's registration No. with the Office  
P-55, 144

Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

## Continuation of Box No. III

## FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

*If none of the following sub-boxes is used, this sheet should not be included in the request.*

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

ALROY, Iris  
Hashirion Street 10/17  
74065 Nes Ziona  
Israel

This person is:

 applicant only applicant and inventor inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
ILState (that is, country) of residence:  
IL

This person is applicant  all designated  all designated States except  the United States of America  of America only  the States indicated in the Supplemental Box for the purposes of: States the United States of America

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

REISS, Yuval  
Hahavazelet 11/6  
Kiriat-ono  
Israel

This person is:

 applicant only applicant and inventor inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
ILState (that is, country) of residence:  
IL

This person is applicant  all designated  all designated States except  the United States of America  of America only  the States indicated in the Supplemental Box for the purposes of: States the United States of America

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

YAAR, Liora  
8 Kalisher Street  
43354 Raanana  
Israel

This person is:

 applicant only applicant and inventor inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
ILState (that is, country) of residence:  
IL

This person is applicant  all designated  all designated States except  the United States of America  of America only  the States indicated in the Supplemental Box for the purposes of: States the United States of America

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

BEN-AVRAHAM, Danny  
Igal Alon 20  
Zichron Jackov  
Israel

This person is:

 applicant only applicant and inventor inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
ILState (that is, country) of residence:  
IL

This person is applicant  all designated  all designated States except  the United States of America  of America only  the States indicated in the Supplemental Box for the purposes of: States the United States of America

Further applicants and/or (further) inventors are indicated on another continuation sheet.

## Continuation of Box No. III

## FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

*If none of the following sub-boxes is used, this sheet should not be included in the request.*

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

TUVIA, Shmuel  
Hartzit 1  
42490 Netanya  
Israel

This person is:

 applicant only applicant and inventor inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
ILState (that is, country) of residence:  
IL

This person is applicant  all designated  all designated States except  the United States of America  the United States of America only  the States indicated in the Supplemental Box for the purposes of: States

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

GREENER, Tsvika  
Hahavazelet 9a  
Ness Ziona  
Israel

This person is:

 applicant only applicant and inventor inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
ILState (that is, country) of residence:  
IL

This person is applicant  all designated  all designated States except  the United States of America  the United States of America only  the States indicated in the Supplemental Box for the purposes of: States

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

 applicant only applicant and inventor inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant  all designated  all designated States except  the United States of America  the United States of America only  the States indicated in the Supplemental Box for the purposes of: States

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

 applicant only applicant and inventor inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant  all designated  all designated States except  the United States of America  the United States of America only  the States indicated in the Supplemental Box for the purposes of: States

Further applicants and/or (further) inventors are indicated on another continuation sheet.

**Supplemental Box** If the Supplemental Box is not used, this sheet should not be included in the request.

- Appl  
cat  
ion  
No.**
1. If, in any of the Boxes except Boxes Nos. VIII(i) to (v) for which a special continuation box is provided, the space is insufficient to furnish all the information: in such case, write "Continuation of box No. ...." (indicate the number of the Box) and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient, in particular:
  - (i) if more than two persons are to be indicated as applicants and/or inventors and no "continuation sheet" is available: in such case, write "Continuation of Box No. III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below;
  - (ii) if, in Box No. II or in any of the sub-boxes of Box No. III, the indication "the States indicated in the Supplemental Box" is checked: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the applicant(s) involved and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is applicant;
  - (iii) if, in Box No. II or in any of the sub-boxes of Box No. III, the inventor or the Inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;
  - (iv) if, in addition to the agent(s) indicated in Box No. IV, there are further agents: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box IV;
  - (v) if, in Box No. VI, there are more than three earlier applications whose priority is claimed: in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI.
2. If, the applicant intends to make an indication of the wish that the international application be treated, in certain designated States, as an application for a patent of addition, certificate of addition, inventor's certificate of addition or utility certificate of addition: in such a case, write the name or two-letter code of each designated States concerned and the indication "patent of addition," "certificate of addition," "Inventor's certificate of addition" or "utility certificate of addition," the number of the parent application or parent patent or other parent grant and the date of grant of the parent patent or other patent grant or the date of filing of the parent application (Rules 4.11(a)(ii) and 49bis.1(a) or (b)).
3. If the applicant intends to make an indication of the wish that the international application be treated, in the United States of America, as a continuation or continuation-in-part of an earlier application: in such a case, write "United States of America" or "US" and the indication "continuation" or "continuation-in-part" and the number and the filing date of the parent application (Rules 4.11(a)(iv) and 49bis.1(d)).

**Continuation of Box No. VI**

- (4) Date: 05 March 2003 (05/03/03) Application: 60/452284  
 National Application Country: US
- (5) Date: 20 March 2003 (20/03/03) Application: 60/456640  
 National Application Country: US
- (6) Date: 03 April 2003 (03/04/03) Application: 60/460526  
 National Application Country: US
- (7) Date: 21 April 2003 (21/04/03) Application: 60/464285  
 National Application Country: US
- (8) Date: 15 May 2003 (15/05/03) Application: 60/471378  
 National Application Country: US
- (9) Date: 20 May 2003 (20/05/03) Application: 60/472327  
 National Application Country: US
- (10) Date: 30 May 2003 (30/05/03) Application: 60/474706  
 National Application Country: US
- (11) Date: 03 June 2003 (03/06/03) Application: 60/475825  
 National Application Country: US
- (12) Date: 17 June 2003 (17/06/03) Application: 60/479317  
 National Application Country: US
- (13) Date: 19 June 2003 (19/06/03) Application: 60/480215  
 National Application Country: US
- (14) Date: 08 August 2003 (08/08/03) Application: 60/493860  
 National Application Country: US
- (15) Date: 16 September 2003 (16/09/03) Application: 60/503931  
 National Application Country: US
- (16) Date: 07 March 2004 (02/03/04) Application: A provisional application filed on March 2, 2004, (Attorney Docket No. PROL-P79-024), in the name of Daniel N. Taglicht, Iris Alroy, Yuval Reiss, Liora Yaar, Danny Ben-Avraham, Shmuel Tuvia and Tsiska Greener entitled "Posh Interacting Proteins and Related Methods."
- National Application Country: US
- (17) Date: 03 March 2003 (03/03/03) Application: 60/451,437  
 National Application Country: US
- (18) Date: 09 May 2003 (09/05/03) Application: 60/469,462  
 National Application Country: US
- (19) Date: 19 June 2003 (19/06/03) Application: 60/480,376  
 National Application Country: US
- (20) Date: 10 November 2003 (10/11/03) Application: US03135712  
 National Application Country: US
- (21) Date: PCT filed 05 February 2004 (Attorney Docket No. PROL-P79-039) in the name of Iris Alroy, Daniel Taglicht, Yuval Reiss, Liora Yaar, and Shmuel Tuvia entitled "Posh Associated Kinases and Related Methods"

**Continuation of Box No. IV:**

Steven Baglio, 51,426; J. Steven Baughman, 47,414; Mark W. Bellomy, 51,452; John V. Bianco, 36,748; Johnny Y. Chen, 46,614; James P. Demers, 34,320; Gojeb L. Frehywot, 52,916; Gloria Fuentes, 47,580; Gregory Glover, 34,173; William G. Gosz, 27,787; Patricia Granahan, 32,227; Z. Angela Guo, 54,144; David P. Halstead, 44,735; Margaret E. Jamroz, 54,196; Edward J. Kelly, 38,936; Charles Larsen, 48,533; Agnes S. Lee, 46,862; Paul E. Lewkowicz, 44,870; Weishi Li, 53,217; Yu Lu, 50,306; Alexander Manganiello, 53,264; Robert A. Mazzarese, 42,852; Christopher Natkanski, 50,365; R. Daniel O'Connor, P54,343; Ignacio Perez de la Cruz, 55,535; Melissa S. Rones, Ph.D., 54,408; Spencer H. Schneider, 45,923; Sanjay Sitlani, 48,489; Wolfgang E. Stutius, 40,256; Erika Takeuchi, 55,661; Lisa Treannie, 41,368; Anita Varma, 43,221; Matthew P. Vincent, 36,709; Dalila Argaez Wendlandt, 52,351; and Levina Wong, P54,551

And all other agents of:

ROPS & GRAY LLP, Patent Group  
 One International Place  
 Boston, Massachusetts 02110-2624  
 United States of America  
 Customer ID No: 28,120

## **Box No. V DESIGNATIONS**

The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.

However,

- DE Germany is not designated for any kind of national protection.

KR Republic of Korea is not designated for any kind of national protection.

RU Russian Federation is not designated for any kind of national protection.

*(The check-boxes above may be used to exclude (irrevocably) the designations concerned in order to avoid the ceasing of the effect, under the national law, of an earlier national application from which priority is claimed. See the Notes to Box No. V as to the consequences of such national law provisions in these and certain other States.)*

**Box No. VI PRIORITY CLAIM**

The priority of the following earlier application(s) is hereby claimed:

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country or Member of WTO	regional application:*	international application receiving Office
item (1)	19 March 2003 (19.03.2003)	60/455760	US	
item (2)	28 August 2003 (28.08.2003)	60/498634	US	
item (3)	04 April 2003 (04.04.2003)	60/460792	US	

Further priority claims are indicated in the Supplemental Box.

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (*only if the earlier application was filed with the Office which for the purposes of this international application is the receiving Office*) identified above as:

- all items     item (1)     item (2)     item (3)     other, see Supplemental Box

\* Where the earlier application is an ARIPO application, indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed (Rule 4.10(b)(ii)): \_\_\_\_\_

**Box No. VII INTERNATIONAL SEARCHING AUTHORITY**

**Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code maybe used):**

ISA/US

**Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):**

Date (day/month/year) Number

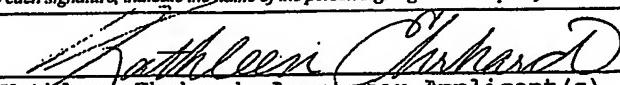
**Country (or regional Office)**

**Box No. VIII      DECLARATIONS**

The following declarations are contained in Boxes Nos. VIII (i) to (v) (mark the applicable check-boxes below and indicate in the right column the number of each type of declaration):

### Number of declarations

- |                          |                    |  |
|--------------------------|--------------------|--|
| <input type="checkbox"/> | Box No. VIII (i)   | Declaration as to the identity of the inventor   |
| <input type="checkbox"/> | Box No. VIII (ii)  | Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent             |
| <input type="checkbox"/> | Box No. VIII (iii) | Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application |
| <input type="checkbox"/> | Box No. VIII (iv)  | Declaration of inventorship (only for the purposes of the designation of the United States of America)                               |
| <input type="checkbox"/> | Box No. VIII (v)   | Declaration as to non-prejudicial disclosures or exceptions to lack of novelty   |

<b>Box No. IX CHECK LIST; LANGUAGE OF FILING</b>																																																																																			
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<p><i>Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).</i></p>  <p>Kathleen Ehrhard, Agent for Applicant(s) ROPS &amp; GRAY LLP</p> <p>(02.03.04)</p>																																																																																			
<p>For receiving Office use only</p> <table> <tr> <td>1. Date of actual receipt of the purported international application:</td> <td>DT02 Rec'd PCT/PTO 02 MAR 2004</td> <td>2. Drawings:</td> </tr> <tr> <td>3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:</td> <td></td> <td><input checked="" type="checkbox"/> received: <input type="checkbox"/> not received:</td> </tr> <tr> <td>4. Date of timely receipt of the required corrections under PCT Article 11(2):</td> <td></td> <td></td> </tr> <tr> <td>5. International Searching Authority (if two or more are competent): ISA / US</td> <td>6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.</td> <td></td> </tr> </table>			1. Date of actual receipt of the purported international application:	DT02 Rec'd PCT/PTO 02 MAR 2004	2. Drawings:	3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		<input checked="" type="checkbox"/> received: <input type="checkbox"/> not received:	4. Date of timely receipt of the required corrections under PCT Article 11(2):			5. International Searching Authority (if two or more are competent): ISA / US	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.																																																																						
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**PCT**  
**FEES CALCULATION SHEET**  
Annex to the Request

Applicant's or agent's file reference PROL-PWO-024

Applicant Proteologics, Inc., et al.

**PCT/US 04/06308**

International Application No.

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**CALCULATION OF PRESCRIBED FEES**1. TRANSMITTAL FEE . . . . . 300.00 T 300-2. SEARCH FEE . . . . . 1,000.00 S 1000-International search to be carried out by US*(If two or more International Searching Authorities are competent to carry out the international search, indicate the name of the Authority which is chosen to carry out the international search.)*

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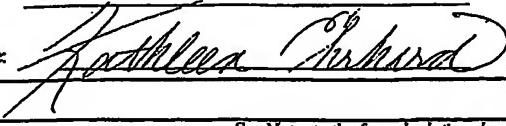
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## POSH INTERACTING PROTEINS AND RELATED METHODS

### RELATED APPLICATIONS

This application claims the benefit of priority of U.S. Provisional Application number 60/451,437 filed 3 March 2003; 60/452,284 filed 5 March 5 2003; 60/456,640 filed 20 March 2003; 60/460,526 filed 3 April 2003; 60/464,285 filed 21 April 2003; 60/469,462 filed 9 May 2003; 60/471,378 filed 15 May 2003; 60/472,327 filed 20 May 2003; 60/474,706 filed 30 May 2003; 60/475,825 filed 3 June 2003; 60/479,317 filed 17 June 2003; 60/480,376 filed 19 June 2003; 10 60/480,215 filed 19 June 2003; 60/493,860 filed 8 August 2003; 60/503,931 filed 16 September 2003; 60/455,760 filed 19 March 2003; 60/460,792 filed 4 April 2003; 60/498,634 filed 28 August 2003; and a provisional application filed on March 2, 2004, (Attorney Docket No. PROL-P79-024), in the name of Daniel N. Taglicht, Iris Alroy, Yuval Reiss, Liora Yaar, Danny Ben-Avraham, Shmuel Tuvia, and Tsvika Greener entitled "Posh Interacting Proteins and Related Methods"; a PCT 15 application US03/35712 filed 10 November 2003; and a PCT application filed on February 5, 2004, (Attorney Docket No. PROL-PWO-039), in the name of Iris Alroy, Daniel Taglicht, Yuval Reiss, Liora Yaar, and Shmuel Tuvia entitled "Posh Associated Kinases and Related Methods". The teachings of the referenced Applications are incorporated herein by reference in their entirety.

20

### BACKGROUND

Potential drug target validation involves determining whether a DNA, RNA or protein molecule is implicated in a disease process and is therefore a suitable target for development of new therapeutic drugs. Drug discovery, the process by 25 which bioactive compounds are identified and characterized, is a critical step in the development of new treatments for human diseases. The landscape of drug discovery has changed dramatically due to the genomics revolution. DNA and protein sequences are yielding a host of new drug targets and an enormous amount of associated information.

30 The identification of genes and proteins involved in various disease states or key biological processes, such as inflammation and immune response, is a vital part

of the drug design process. Many diseases and disorders could be treated or prevented by decreasing the expression of one or more genes involved in the molecular etiology of the condition if the appropriate molecular target could be identified and appropriate antagonists developed. For example, cancer, in which one or more cellular oncogenes become activated and result in the unchecked progression of cell cycle processes, could be treated by antagonizing appropriate cell cycle control genes. Furthermore many human genetic diseases, such as Huntington's disease, and certain prion conditions, which are influenced by both genetic and epigenetic factors, result from the inappropriate activity of a polypeptide as opposed to the complete loss of its function. Accordingly, antagonizing the aberrant function of such mutant genes would provide a means of treatment. Additionally, infectious diseases such as HIV have been successfully treated with molecular antagonists targeted to specific essential retroviral proteins such as HIV protease or reverse transcriptase. Drug therapy strategies for treating such diseases and disorders have frequently employed molecular antagonists which target the polypeptide product of the disease gene(s). However, the discovery of relevant gene or protein targets is often difficult and time consuming.

One area of particular interest is the identification of host genes and proteins that are co-opted by viruses during the viral life cycle. The serious and incurable nature of many viral diseases, coupled with the high rate of mutations found in many viruses, makes the identification of antiviral agents a high priority for the improvement of world health. Genes and proteins involved in a viral life cycle are also appealing as a subject for investigation because such genes and proteins will typically have additional activities in the host cell and may play a role in other non-viral disease states.

Other areas of interest include the identification of genes and proteins involved in cancer, apoptosis and neural disorders (particularly those associated with apoptotic neurons, such as Alzheimer's disease).

It would be beneficial to identify proteins involved in one or more of these processes for use in, among other things, drug screening methods. Additionally, once a protein involved in one or more processes of interest has been identified, it is possible to identify proteins that associate, directly or indirectly, with the initially

identified protein. Knowledge of interactors will provide insight into protein assemblages and pathways that participate in disease processes, and in many cases an interacting protein will have desirable properties for the targeting of therapeutics. In some cases, an interacting protein will already be known as a drug target, but in a different biological context. Thus, by identifying a suite of proteins that interact with an initially identified protein, it is possible to identify novel drug targets and new uses for previously known therapeutics.

## SUMMARY

This application provides isolated, purified or recombinant complexes comprising a POSH polypeptide and one or more POSH-associated protein (POSH-AP). In certain aspects, the POSH-AP comprises a polypeptide selected from the group consisting of: PKA, SNX1, SNX3, ATP6V0C, PTPN12, PPP1CA, GOSR2, CENTB1, DDEF1, ARF1, ARF5, PACS-1, EPS8L2, HERPUD1, UNC84B, MSTP028, GOCAP, EIF3S3, SRA1, CBL-B, RALA, SIAH1, SMN1, SMN2, SYNE1, TTC3, VCY2IP1 and UBE2N (UBC13). In other aspects, the POSH-AP comprises a polypeptide selected from the group consisting of: ARHV (Chp), WASF1, HIP55, SPG20, HLA-A, and HLA-B. In further aspects, the POSH-AP comprises one or more polypeptides set forth in Table 8. In certain embodiments the POSH polypeptide is a human POSH polypeptide.

In certain embodiments, this application provides isolated, purified or recombinant complexes comprising a HERPUD1 polypeptides and a ubiquitin ligase, examples of the ubiquitin ligase include CBL-B, TTC3, and SIAH1.

In certain embodiments, the application provides methods for identifying agents that modulates an activity of a POSH polypeptide or POSH-AP, comprising identifying an agent that disrupts a complex of a POSH polypeptide and a POSH-AP, wherein an agent that disrupts such a complex is an agent that modulates an activity of the POSH polypeptide or the POSH-AP.

In yet other embodiments, the application provides methods of identifying an antiviral agent, comprising identifying a test agent that disrupts a complex comprising a POSH polypeptide and a POSH-AP and evaluating the effect of the test agent on either a pro-infective or pro-replicative function of a virus is an

antiviral agent, wherein an agent inhibits such a function of a virus is an antiviral agent. In certain embodiments the POSH-AP is selected from the group consisting of: PKA, SNX1, SNX3, PTPN12, GOSR2, CENTB1, ARF1, ARF5, PACS-1, EPS8L2, HERPUD1, SMN1, SMN2, UNC84B, MSTP028, GOCAP, CBL-B, SYNE1, UBE2N (UBC13), SIAH1, TTC3, WASF1, HIP55, RALA, and SPG20.

5 Examples of such viruses include for example, envelope viruses such as the Human Immunodeficiency Virus, the West Nile Virus, and the Moloney Murine Leukemia Virus (MMuLV).

In other embodiments, the application provides methods of identifying an anti-apoptotic agent, comprising identifying a test agent that disrupts a complex comprising a POSH polypeptide and a POSH-AP and evaluating the effect of the test agent on apoptosis of a cell wherein an agent that decreases apoptosis of the cell is an anti-apoptotic agent. In yet other embodiments, the application provides methods of identifying an anti-cancer agent, comprising identifying a test agent that disrupts a complex comprising a POSH polypeptide and a POSH-AP and evaluating the effect of the test agent on proliferation or survival of a cancer cell, wherein an agent that decreases proliferation or survival of a cancer cell is an anti-cancer agent. Examples of the POSH-AP include PKA, SNX1, PTPN12, PPP1CA, ARF1, ARF5, CENTB1, EPS8L2, EIF3S3, CBL-B, RALA, SIAH1, TTC3, ATP6V0C, and VCY2IP1. In certain embodiments, the cancer is a POSH-associated cancer.

20 In certain aspects, the application provides methods of identifying an agent that inhibits trafficking of a protein through the secretory pathway, comprising identifying a test agent that disrupts a complex comprising a POSH polypeptide and a POSH-AP and evaluating the effect of the test agent on the trafficking of a protein through the secretory pathway wherein an agent that disrupts localization of said POSH-AP is an agent that inhibits trafficking of a protein through the secretory pathway. In certain embodiments, the protein is a myristoylated protein. In yet other embodiments, the protein is a viral protein. In alternative embodiments, the protein is associated with a neurological disorder such as for example the amyloid beta precursor protein.

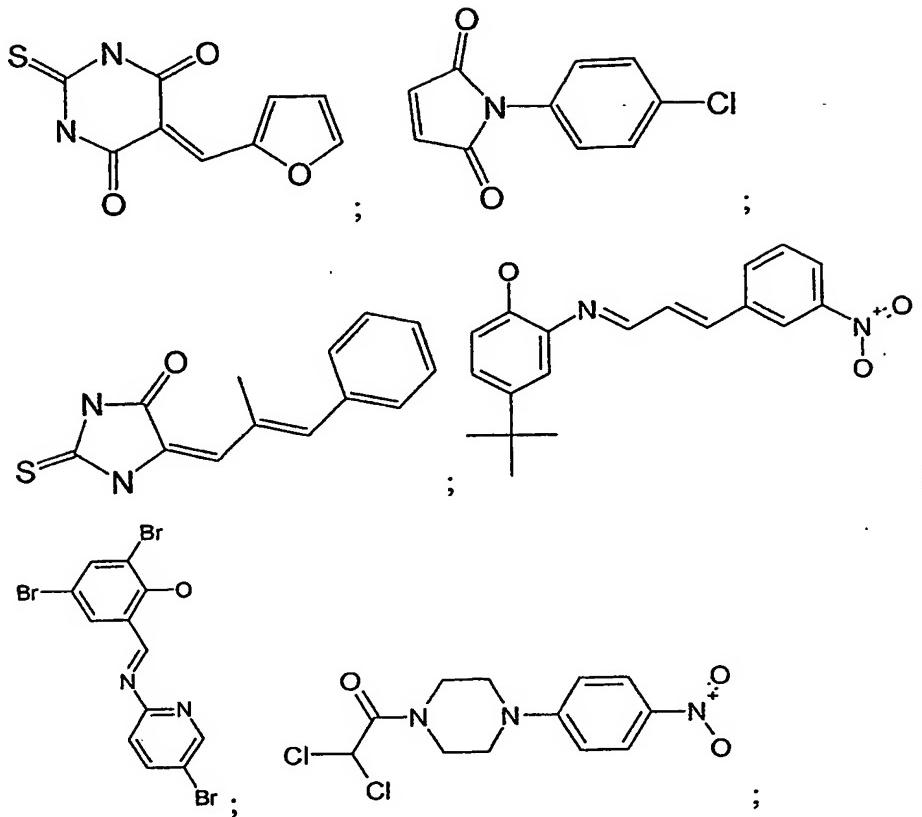
25 In yet other embodiments, the application provides methods of identifying an agent that inhibits the progression of a neurological disorder, comprising identifying

a test agent that disrupts a complex comprising a POSH polypeptide and a POSH-AP evaluating the effect of the test agent on the trafficking of a protein through the secretory pathway wherein an agent that disrupts localization of a POSH-AP is an agent that inhibits progression of a neurological disorder. In certain aspects the  
5 POSH-AP is HERPUD1.

In yet other embodiments, this application provides methods of treating a viral infection in a subject in need thereof, comprising administering an agent that inhibits a POSH-AP in an amount sufficient to inhibit the viral infection. The agent is one that: inhibits a kinase activity of the POSH-AP; inhibits expression of the  
10 POSH-AP; inhibits the ubiquitin ligase activity of the POSH-AP; inhibits the phosphatase activity of the POSH-AP; inhibits the GTPase activity of the POSH-AP; and inhibits the ubiquitination of the POSH-AP. In certain embodiments, the POSH-AP comprises a polypeptide selected from the group consisting of: PKA,  
SNX1, SNX3, SMN1, SMN2, PTPN12, GOSR2, CENTB1, ARF1, ARF5, PACS-1,  
15 EPS8L2, HERPUD1, UNC84B, MSTP028, GOCAP, CBL-B, SYNE1, UBE2N (UBC13), SIAH1, TTC3, WASF1, HIP55, RALA, and SPG20. In certain aspects, the agent may be an siRNA construct, a small molecule, an antibody, or an antisense construct.

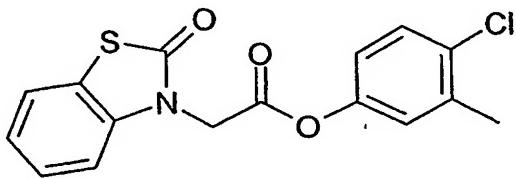
In certain embodiments, the agent is an siRNA construct comprising a nucleic acid sequence that hybridizes to an mRNA encoding the POSH-AP.  
20 Examples include siRNA constructs that inhibit the expression of HERPUD1 or MSTP028. Examples of siRNA constructs that inhibit the expression of HERPUD1 include: 5'GGAAGUUCUUCGGAACCUdTdT-3' and 5'- dTdTCCCUUCAAGAACGUUGGA-5'. Examples of siRNA constructs that inhibit the expression of MSTP028 include: 5'-AAGTGCTCACCGACAGTGAAG-  
25 3' and 5'-AAGATACTTATGAGCCTTCT-3'.

In other aspects, the agents may be a small molecule inhibitor is selected from among the following categories: adenosine cyclic monophosphorothioate, isoquinolinesulfonamide, piperazine, piceatannol, and ellagic acid. In alternative  
30 embodiments, the agents may be a small molecule inhibitor that inhibits the ligase activity of a POSH polypeptide or inhibits the ubiquitination of a POSH-AP. Examples of such small molecules include, for example:



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and



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In certain embodiments, the application provides packaged pharmaceuticals for treating viral infections, comprising: a pharmaceutical composition comprising an inhibitor of a POSH-AP and a pharmaceutically acceptable carrier and instructions for use.

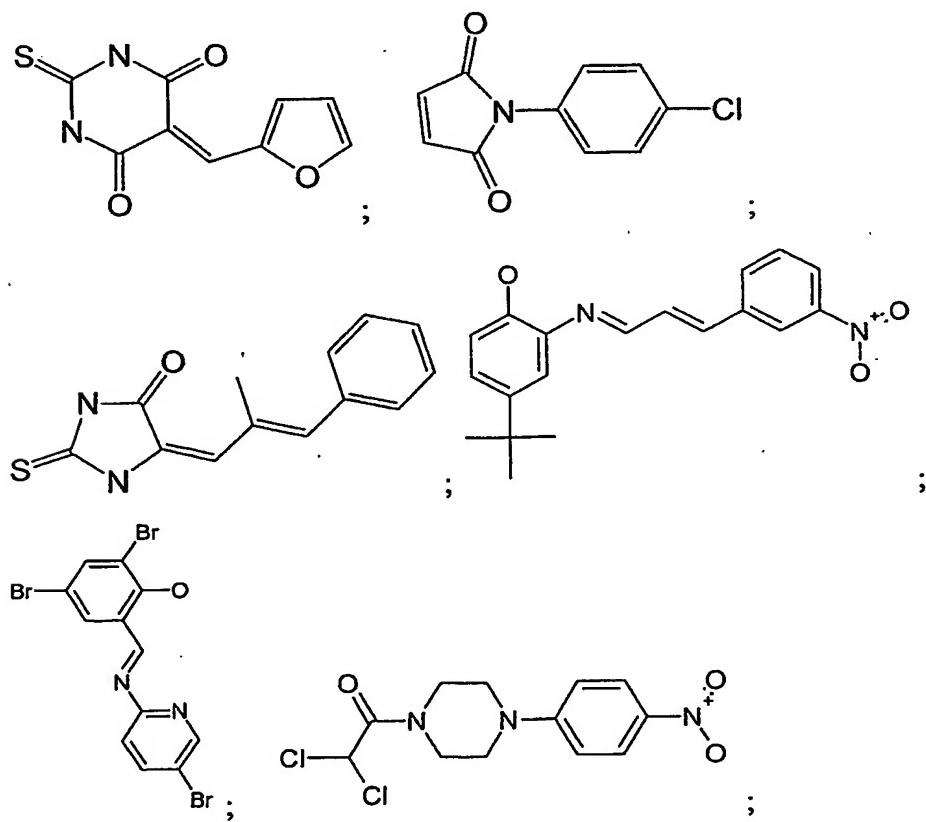
15 In certain embodiments, the application provides methods of treating or preventing a POSH associated cancer in a subject comprising administering an agent that inhibits a POSH-AP to a subject in need thereof, wherein said agent treats or

prevents cancer. The POSH-AP comprises a polypeptide selected from the group consisting of: PKA, SNX1, PTPN12, PPP1CA, CENTB1, ARF1, ARF5, EPS8L2, EIF3S3, CBL-B, RALA, SIAH1, TTC3, ATP6V0C, and VCY2IP1.

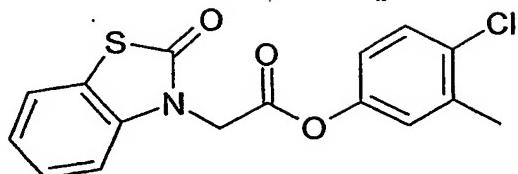
In yet other aspects, the application provides methods of treating a neurological disorder comprising administering an agent to a subject in need thereof, wherein said agent either inhibits the Ubiquitin ligase activity of POSH or inhibits the ubiquitination of a POSH-AP. Examples of the POSH-AP include: PTPN12, DDEF1, EPS8L2, HERPUD1, GOCAP, CBL-B, SIAH1, SMN1, SMN2, TTC3, SPG20, SNX1, and ARF1.

Examples of the neurological disorders include Alzheimer's disease, Parkinson's disease, Huntington's disease, schizophrenia, Niemann-Pick's disease, and prion-associated diseases. In certain aspects, the agent is selected from the group consisting of: an siRNA construct, a small molecule, an antibody, and an antisense construct. Examples of the small molecules include:

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and



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In certain aspects, the disclosure provides methods of treating viral hepatitis in a subject in need thereof. Such a method may comprise administering an effective amount of an agent that inhibits POSH or disrupts an interaction between POSH and a dynamin, preferably dynamin II. In certain embodiments, the subject 10 has a viral hepatitis caused by HBV or HCV.

In certain aspects, the disclosure provides methods of inhibiting a hepatotropic virus or a method for treating a disease associated with a hepatotropic virus, comprising administering an effective amount of an agent, wherein said agent inhibits POSH or an interaction between POSH and dynamin. In certain 15 embodiments, the hepatotropic virus is selected from the group consisting of HAV, HBV, HCV, HDV, and HEV. The hepatotropic virus associated disease may be, for example, viral hepatitis or hepatocellular carcinoma. An agent for any of the above methods may include, for example, a nucleic acid agent that decreases the level of POSH in cells of the subject (e.g., an antisense oligonucleotide, an RNAi 20 construct, a DNA enzyme, a ribozyme) or small molecule inhibitors of POSH, as well as antibodies or other binding agents that bind to a surface of POSH or dynamin that participates in a POSH-dynamin interaction. An agent may be any of the following: a small molecule, an antibody, a fragment of an antibody, a peptidomimetic, and a polypeptide. Examples of small molecules include:

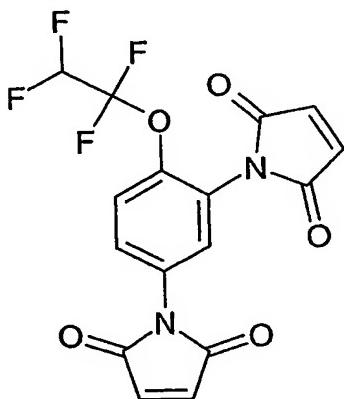
STRUCTURE	MW	CAS number
	384.2	14567-55-4
	389.5	414908-38-0

In certain embodiments, the application provides methods for inhibiting an  
HBV infection in a subject in need thereof, comprising administering an effective  
amount of a POSH inhibitor, wherein the HBV infection is inhibited in the subject.  
In additional embodiments, the disclosure provides methods for treating an HBV  
infection in a patient, comprising administering an effective amount of an agent that  
inhibits POSH or decreases the level of POSH protein or nucleic acid in an infected  
cell. An agent may be, for example, an RNAi construct that inhibits the expression  
of POSH. Optionally the RNAi construct is 20-25 nucleotides in length and  
optionally it is selected from any one of SEQ ID NOS: 15, 16, 18, 19, 21, 22, 24,  
and 25. The RNAi may be formulated as a liposome. An agent may be a small  
molecule inhibitor of POSH ubiquitin ligase activity, as disclosed herein. Examples  
of small molecule inhibitors of POSH include:

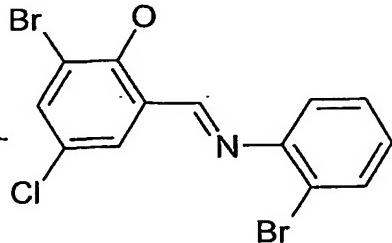
STRUCTURE	MW	CAS number
	384.2	14567-55-4
	389.5	414908-38-0

In certain aspects, the disclosure provides a method for treating an HBV infection in a patient, comprising administering an effective amount of an antisense oligonucleotide sufficient to bind a nucleic acid molecule, which nucleic acid molecule encodes a POSH polypeptide.

In certain embodiments, the application provides methods for inhibiting an HBV infection by administering an effective amount of a compound of the formula:



In additional embodiments, the application provides methods for treating an HBV infection by administering an effective amount of a compound of the formula:



In certain aspects, the disclosure provides methods for inhibiting the maturation of a lentivirus by modulating the activity of a Vpu polypeptide. In preferred embodiments, maturation of the lentivirus is inhibited by inhibiting the transport and/or assembly of viral particles in the TGN and from the TGN to the plasma membrane. A preferred lentivirus for application of such a method is the human immunodeficiency virus.

5 In certain aspects, the disclosure provides methods of inhibiting viral infection comprising administering an agent to a subject in need thereof, wherein 10 said agent inhibits the interaction between a POSH polypeptide and Vpu.

In certain aspects, the disclosure provides methods for identifying a target 15 polypeptide for antiviral therapy, the method comprising: a) selecting a test polypeptide known to localize or predicted to localize to the trans Golgi network; b) inhibiting an activity of the test polypeptide in a cell infected with a viral construct under conditions where, but for the inhibition of the activity of the test polypeptide, 20 viral particles are released from the cell; and c) determining whether viral particles are released from the cell, wherein, if inhibiting the activity of the test polypeptide in the cell inhibits the release of viral particles from the cell, the test polypeptide is a target polypeptide for antiviral therapy. In a preferred embodiment, the test polypeptide is Vpu. Vpu activity may be inhibited, for example, by siRNA, antisense or other nucleic acid based method.

In certain aspects, the disclosure provides isolated, purified or recombinant complexes comprising a POSH polypeptide and a Vpu polypeptide. The POSH polypeptide may comprise, for example, a POSH SH3 domain, or a polypeptide at least 80% identical to such an SH3 domain. An antiviral agent may be selected 25 based on its ability to disrupt a POSH-Vpu complex.

The practice of the present application will employ, unless otherwise indicated, conventional techniques of cell biology, cell culture, molecular biology,

transgenic biology, microbiology, recombinant DNA, and immunology, which are within the skill of the art. Such techniques are explained fully in the literature. See, for example, *Molecular Cloning A Laboratory Manual*, 2nd Ed., ed. by Sambrook, Fritsch and Maniatis (Cold Spring Harbor Laboratory Press: 1989); *DNA Cloning*, 5 Volumes I and II (D. N. Glover ed., 1985); *Oligonucleotide Synthesis* (M. J. Gait ed., 1984); Mullis et al. U.S. Patent No: 4,683,195; *Nucleic Acid Hybridization* (B. D. Hames & S. J. Higgins eds. 1984); *Transcription And Translation* (B. D. Hames & S. J. Higgins eds. 1984); *Culture Of Animal Cells* (R. I. Freshney, Alan R. Liss, Inc., 1987); *Immobilized Cells And Enzymes* (IRL Press, 1986); B. Perbal, *A 10 Practical Guide To Molecular Cloning* (1984); the treatise, *Methods In Enzymology* (Academic Press, Inc., N.Y.); *Gene Transfer Vectors For Mammalian Cells* (J. H. Miller and M. P. Calos eds., 1987, Cold Spring Harbor Laboratory); *Methods In Enzymology*, Vols. 154 and 155 (Wu et al. eds.), *Immunochemical Methods In Cell 15 And Molecular Biology* (Mayer and Walker, eds., Academic Press, London, 1987); *Handbook Of Experimental Immunology*, Volumes I-IV (D. M. Weir and C. C. Blackwell, eds., 1986); *Manipulating the Mouse Embryo*, (Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y., 1986).

Other features and advantages of the application will be apparent from the following detailed description, and from the claims.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows human POSH coding sequence (SEQ ID NO:1).

Figure 2 shows human POSH amino acid sequence (SEQ ID NO:2).

Figure 3 shows human POSH cDNA sequence (SEQ ID NO:3).

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Figure 4 shows 5' cDNA fragment of human POSH (public gi:10432611; SEQ ID NO:4).

Figure 5 shows N terminus protein fragment of hPOSH (public gi:10432612; SEQ ID NO:5).

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Figure 6 shows 3' mRNA fragment of hPOSH (public gi:7959248; SEQ ID NO:6).

Figure 7 shows C terminus protein fragment of hPOSH (public gi:7959249; SEQ ID NO:7).

Figure 8 shows human POSH full mRNA, annotated sequence.

Figure 9 shows domain analysis of human POSH.

Figure 10 is a diagram of human POSH nucleic acids. The diagram shows the full-length POSH gene and the position of regions amplified by RT-PCR or targeted by siRNA used in figure 11.

Figure 11 shows effect of knockdown of POSH mRNA by siRNA duplexes. HeLa S S-6 cells were transfected with siRNA against Lamin A/C (lanes 1, 2) or POSH (lanes 3-10). POSH siRNA was directed against the coding region (153 - lanes 3, 4; 155 - lanes 5, 6) or the 3'UTR (157 - lanes 7, 8; 159 - lanes 9, 10). Cells were harvested 24 hours post-transfection, RNA extracted, and POSH mRNA levels compared by RT-PCR of a discrete sequence in the coding region of the POSH gene (see figure 10). GAPDH is used an RT-PCR control in each reaction.

Figure 12 shows that POSH affects the release of VLP from cells. A) Phosphohimages of SDS-PAGE gels of immunoprecipitations of <sup>35</sup>S pulse-chase labeled Gag proteins are presented for cell and viral lysates from transfected HeLa cells that were either untreated or treated with POSH RNAi (50 nM for 48 hours). The time during the chase period (1, 2, 3, 4, and 5 hours after the pulse) are presented from left to right for each image.

Figure 13 shows release of VLP from cells at steady state. Hela cells were transfected with an HIV-encoding plasmid and siRNA. Lanes 1, 3 and 4 were transfected with wild-type HIV-encoding plasmid. Lane 2 was transfected with an HIV-encoding plasmid which contains a point mutation in p6 (PTAP to ATAP). Control siRNA (lamin A/C) was transfected to cells in lanes 1 and 2. siRNA to Tsg101 was transfected in lane 4 and siRNA to POSH in lane 3.

Figure 14 shows mouse POSH mRNA sequence (public gi:10946921; SEQ ID NO: 8).

Figure 15 shows mouse POSH Protein sequence (Public gi:10946922; SEQ ID NO: 9).

Figure 16 shows Drosophila melanogaster POSH mRNA sequence (public gi:17737480; SEQ ID NO:10).

Figure 17 shows Drosophila melanogaster POSH protein sequence (public gi:17737481; SEQ ID NO:11).

Figure 18 shows POSH domain analysis.

Figure 19 shows that human POSH has ubiquitin ligase activity.

—Figure 20 shows that human POSH co-immunoprecipitates with RAC1.

Figure 21 shows that POSH knockdown results in decreased secretion of  
5 phospholipase D (“PLD”).

Figure 22 shows effect of hPOSH on Gag-EGFP intracellular distribution.

Figure 23 shows intracellular distribution of HIV-1 Nef in hPOSH-depleted  
cells.

Figure 24 shows intracellular distribution of Src in hPOSH-depleted cells.

10 Figure 25 shows intracellular distribution of Rapsyn in hPOSH-depleted  
cells.

Figure 26 shows that POSH reduction by siRNA abrogates West Nile virus  
infectivity.

15 Figure 27 shows that POSH knockdown decreases the release of extracellular  
MMuLV particles.

Figure 28 shows that knock-down of human POSH entraps HIV virus  
particles in intracellular vesicles. HIV virus release was analyzed by electron  
microscopy following siRNA and full-length HIV plasmid transfection. Mature  
viruses were secreted by cells transfected with HIV plasmid and non-relevant siRNA  
20 (control, bottom panel). Knockdown of Tsg101 protein resulted in a budding defect,  
the viruses that were released had an immature phenotype (top panel). Knockdown  
of hPOSH levels resulted in accumulation of viruses inside the cell in intracellular  
vesicles (middle panel).

25 Figure 29A shows siRNA-mediated reduction of MSTP028 expression  
inhibits HIV virus-like particle production (Experiment 1).

Figure 29B shows siRNA-mediated reduction of MSTP028 expression  
inhibits HIV virus-like particle production (Experiment 2).

30 Figure 30 shows putative PKA phosphorylation sites in hPOSH. Amino acid  
sequence of hPOSH (70 residues per line): Motifs of the low stringency RxxS/T  
type are underlined. The high stringency motif R/KR/KxS/T is bordered. Putative  
S/T phosphorylation sites are highlighted in green. Color-coding of domains: Red –  
RING, Blue – SH3, Green – putative Rac-1 Binding Domain.

Figure 31 shows that phosphorylation of hPOSH regulates binding of GTP-loaded Rac-1. Bacterially expressed hPOSH (1 µg) (POSH) or GST (1 µg) (NS) were phosphorylated. Subsequently, GTP $\gamma$ S loaded or unloaded recombinant Rac-1 (0.2 µg) was added to hPOSH or GST. Bound rac1 was isolated as described in materials and methods and samples separated by SDS-PAGE on a 12% gel and immunoblotted with anti-Rac-1. Input is 0.25 µg of Rac-1.

5 Figure 32 shows domain analysis of various POSH-APs.  
Figure 33 shows siRNA-mediated reduction in HERPUD1 expression reduces HIV maturation.

10 Figure 34A shows that endogenous Herp levels are reduced in H153 cells. H153 (POSH-RNAi) and H187 (control RNAi) cells were transfected with a plasmid encoding Flag-ubiquitin. Total cell lysates (A) or Flag-immunoprecipitated material (B) were separated on 10% SDS-PAGE and immunoblotted with anti-Herp antibodies.

15 Figure 34B shows that exogenous Herp levels and its ubiquitination are reduced in POSH-depleted cells. H153 and H187 cells were co-transfected with Herp or control plasmids and a plasmid encoding Flag-ubiquitin (indicated above the figure). Total (A) and flag-immunoprecipitated material (B) were separated on 10% SDS-PAGE and immunoblotted with anti-Herp antibodies.

20 Figure 35 shows that the compounds CAS number 14567-55-4 and CAS number 414908-38-0 (lanes 7 and 8) inhibit HBV production.

Figure 36 provides the nucleic acid and amino acid sequences of POSH-APs.

#### DETAILED DESCRIPTION OF THE APPLICATION

25 1. Definitions

The term "binding" refers to a direct association between two molecules, due to, for example, covalent, electrostatic, hydrophobic, ionic and/or hydrogen-bond interactions under physiological conditions.

30 A "chimeric protein" or "fusion protein" is a fusion of a first amino acid sequence encoding a polypeptide with a second amino acid sequence defining a domain foreign to and not substantially homologous with any domain of the first amino acid sequence. A chimeric protein may present a foreign domain which is

found (albeit in a different protein) in an organism which also expresses the first protein, or it may be an "interspecies", "intergenic", etc. fusion of protein structures expressed by different kinds of organisms.

The terms "compound", "test compound" and "molecule" are used herein interchangeably and are meant to include, but are not limited to, peptides, nucleic acids, carbohydrates, small organic molecules, natural product extract libraries, and any other molecules (including, but not limited to, chemicals, metals and organometallic compounds).

The phrase "conservative amino acid substitution" refers to grouping of amino acids on the basis of certain common properties. A functional way to define common properties between individual amino acids is to analyze the normalized frequencies of amino acid changes between corresponding proteins of homologous organisms (Schulz, G. E. and R. H. Schirmer, Principles of Protein Structure, Springer-Verlag). According to such analyses, groups of amino acids may be defined where amino acids within a group exchange preferentially with each other, and therefore resemble each other most in their impact on the overall protein structure (Schulz, G. E. and R. H. Schirmer, Principles of Protein Structure, Springer-Verlag). Examples of amino acid groups defined in this manner include:

- (i) a charged group, consisting of Glu and Asp, Lys, Arg and His,
- 20 (ii) a positively-charged group, consisting of Lys, Arg and His,
- (iii) a negatively-charged group, consisting of Glu and Asp,
- (iv) an aromatic group, consisting of Phe, Tyr and Trp,
- (v) a nitrogen ring group, consisting of His and Trp,
- (vi) a large aliphatic nonpolar group, consisting of Val, Leu and Ile,
- 25 (vii) a slightly-polar group, consisting of Met and Cys,
- (viii) a small-residue group, consisting of Ser, Thr, Asp, Asn, Gly, Ala, Glu, Gln and Pro,
- (ix) an aliphatic group consisting of Val, Leu, Ile, Met and Cys, and
- (x) a small hydroxyl group consisting of Ser and Thr.

30 In addition to the groups presented above, each amino acid residue may form its own group, and the group formed by an individual amino acid may be referred to

simply by the one and/or three letter abbreviation for that amino acid commonly used in the art.

5 A "conserved residue" is an amino acid that is relatively invariant across a range of similar proteins. Often conserved residues will vary only by being replaced with a similar amino acid, as described above for "conservative amino acid substitution".

The term "domain" as used herein refers to a region of a protein that comprises a particular structure and/or performs a particular function.

10 The term "envelope virus" as used herein refers to any virus that uses cellular membrane and/or any organelle membrane in the viral release process.

"Homology" or "identity" or "similarity" refers to sequence similarity between two peptides or between two nucleic acid molecules. Homology and identity can each be determined by comparing a position in each sequence which may be aligned for purposes of comparison. When an equivalent position in the compared sequences is occupied by the same base or amino acid, then the molecules are identical at that position; when the equivalent site occupied by the same or a similar amino acid residue (e.g., similar in steric and/or electronic nature), then the molecules can be referred to as homologous (similar) at that position. Expression as a percentage of homology/similarity or identity refers to a function of the number of 15 identical or similar amino acids at positions shared by the compared sequences. A sequence which is "unrelated" or "non-homologous" shares less than 40% identity, though preferably less than 25% identity with a sequence of the present application. In comparing two sequences, the absence of residues (amino acids or nucleic acids) 20 or presence of extra residues also decreases the identity and homology/similarity.

25 The term "homology" describes a mathematically based comparison of sequence similarities which is used to identify genes or proteins with similar functions or motifs. The nucleic acid and protein sequences of the present application may be used as a "query sequence" to perform a search against public databases to, for example, identify other family members, related sequences or 30 homologs. Such searches can be performed using the NBLAST and XBLAST programs (version 2.0) of Altschul, et al. (1990) J Mol. Biol. 215:403-10. BLAST nucleotide searches can be performed with the NBLAST program, score=100,

wordlength=12 to obtain nucleotide sequences homologous to nucleic acid molecules of the application. BLAST protein searches can be performed with the XBLAST program, score=50, wordlength=3 to obtain amino acid sequences homologous to protein molecules of the application. To obtain gapped alignments 5 for comparison purposes, Gapped BLAST can be utilized as described in Altschul et al., (1997) Nucleic Acids Res. 25(17):3389-3402. When utilizing BLAST and Gapped BLAST programs, the default parameters of the respective programs (e.g., XBLAST and BLAST) can be used. See <http://www.ncbi.nlm.nih.gov>.

As used herein, "identity" means the percentage of identical nucleotide or 10 amino acid residues at corresponding positions in two or more sequences when the sequences are aligned to maximize sequence matching, i.e., taking into account gaps and insertions. Identity can be readily calculated by known methods, including but not limited to those described in (Computational Molecular Biology, Lesk, A. M., ed., Oxford University Press, New York, 1988; Biocomputing: Informatics and 15 Genome Projects, Smith, D. W., ed., Academic Press, New York, 1993; Computer Analysis of Sequence Data, Part I, Griffin, A. M., and Griffin, H. G., eds., Humana Press, New Jersey, 1994; Sequence Analysis in Molecular Biology, von Heinje, G., Academic Press, 1987; and Sequence Analysis Primer, Gribskov, M. and Devereux, J., eds., M Stockton Press, New York, 1991; and Carillo, H., and Lipman, D., SIAM 20 J. Applied Math., 48: 1073 (1988). Methods to determine identity are designed to give the largest match between the sequences tested. Moreover, methods to determine identity are codified in publicly available computer programs. Computer program methods to determine identity between two sequences include, but are not limited to, the GCG program package (Devereux, J., et al., Nucleic Acids Research 25 25 12(1): 387 (1984)), BLASTP, BLASTN, and FASTA (Altschul, S. F. et al., J. Molec. Biol. 215: 403-410 (1990) and Altschul et al. Nuc. Acids Res. 25: 3389-3402 (1997)). The BLAST X program is publicly available from NCBI and other sources (BLAST Manual, Altschul, S., et al., NCBI NLM NIH Bethesda, Md. 20894; Altschul, S., et al., J. Mol. Biol. 215: 403-410 (1990). The well known Smith 30 Waterman algorithm may also be used to determine identity.

The term "isolated", as used herein with reference to the subject proteins and protein complexes, refers to a preparation of protein or protein complex that is

essentially free from contaminating proteins that normally would be present with the protein or complex, e.g., in the cellular milieu in which the protein or complex is found endogenously. Thus, an isolated protein complex is isolated from cellular components that normally would "contaminate" or interfere with the study of the complex in isolation, for instance while screening for modulators thereof. It is to be understood, however, that such an "isolated" complex may incorporate other proteins the modulation of which, by the subject protein or protein complex, is being investigated.

The term "isolated" as also used herein with respect to nucleic acids, such as DNA or RNA, refers to molecules in a form which does not occur in nature. Moreover, an "isolated nucleic acid" is meant to include nucleic acid fragments which are not naturally occurring as fragments and would not be found in the natural state.

Lentiviruses include primate lentiviruses, e.g., human immunodeficiency virus types 1 and 2 (HIV-1/HIV-2); simian immunodeficiency virus (SIV) from Chimpanzee (SIVcpz), Sooty mangabey (SIVsmm), African Green Monkey (SIVagm), Syke's monkey (SIVsyk), Mandrill (SIVmnd) and Macaque (SIVmac). Lentiviruses also include feline lentiviruses, e.g., Feline immunodeficiency virus (FIV); Bovine lentiviruses, e.g., Bovine immunodeficiency virus (BIV); Ovine lentiviruses, e.g., Maedi/Visna virus (MVV) and Caprine arthritis encephalitis virus (CAEV); and Equine lentiviruses, e.g., Equine infectious anemia virus (EIAV). All lentiviruses express at least two additional regulatory proteins (Tat, Rev) in addition to Gag, Pol, and Env proteins. Primate lentiviruses produce other accessory proteins including Nef, Vpr, Vpu, Vpx, and Vif. Generally, lentiviruses are the causative agents of a variety of disease, including, in addition to immunodeficiency, neurological degeneration, and arthritis. Nucleotide sequences of the various lentiviruses can be found in Genbank under the following Accession Nos. (from J. M. Coffin, S. H. Hughes, and H. E. Varmus, "Retroviruses" Cold Spring Harbor Laboratory Press, 1997 p 804): 1) HIV-1: K03455, M19921, K02013, M38431, M38429, K02007 and M17449; 2) HIV-2: M30502, J04542, M30895, J04498, M15390, M31113 and L07625; 3) SIV: M29975, M30931, M58410, M66437, L06042, M33262, M19499, M32741, M31345 and L03295; 4) FIV: M25381,

M36968 and U1 1820; 5) BIV: M32690; 6) E1AV: M16575, M87581 and U01866; 6) Visna: M10608, M51543, L06906, M60609 and M60610; 7) CAEV: M33677; and 8) Ovine lentivirus M31646 and M34193. Lentiviral DNA can also be obtained from the American Type Culture Collection (ATCC). For example, feline immunodeficiency virus is available under ATCC Designation No. VR-2333 and VR-3112. Equine infectious anemia virus A is available under ATCC Designation No. VR-778. Caprine arthritis-encephalitis virus is available under ATCC Designation No. VR-905. Visna virus is available under ATCC Designation No. VR-779.

10 As used herein, the term "nucleic acid" refers to polynucleotides such as deoxyribonucleic acid (DNA), and, where appropriate, ribonucleic acid (RNA). The term should also be understood to include, as equivalents, analogs of either RNA or DNA made from nucleotide analogs, and, as applicable to the embodiment being described, single-stranded (such as sense or antisense) and double-stranded 15 polynucleotides.

The term "maturation" as used herein refers to the production, post-translational processing, assembly and/or release of proteins that form a viral particle. Accordingly, this includes the processing of viral proteins leading to the pinching off of nascent virion from the cell membrane.

20 A "POSH nucleic acid" is a nucleic acid comprising a sequence as represented in any of SEQ ID Nos: 1, 3, 4, 6, 8, and 10 as well as any of the variants described herein.

A "POSH polypeptide" or "POSH protein" is a polypeptide comprising a sequence as represented in any of SEQ ID Nos: 2, 5, 7, 9 and 11 as well as any of the 25 variations described herein.

A "POSH-associated protein" or "POSH-AP" refers to a protein capable of interacting with and/or binding to a POSH polypeptide. Generally, the POSH-AP may interact directly or indirectly with the POSH polypeptide. Preferred POSH-APs include those provided in Table 7. Other preferred POSH-APs include those listed 30 in Table 8. Examples of these and other POSH-APs are provided throughout.

The terms peptides, proteins and polypeptides are used interchangeably herein.

The term "purified protein" refers to a preparation of a protein or proteins which are preferably isolated from, or otherwise substantially free of, other proteins normally associated with the protein(s) in a cell or cell lysate. The term "substantially free of other cellular proteins" (also referred to herein as "substantially free of other contaminating proteins") is defined as encompassing individual preparations of each of the component proteins comprising less than 20% (by dry weight) contaminating protein, and preferably comprises less than 5% contaminating protein. Functional forms of each of the component proteins can be prepared as purified preparations by using a cloned gene as described in the attached examples. By "purified", it is meant, when referring to component protein preparations used to generate a reconstituted protein mixture, that the indicated molecule is present in the substantial absence of other biological macromolecules, such as other proteins (particularly other proteins which may substantially mask, diminish, confuse or alter the characteristics of the component proteins either as purified preparations or in their function in the subject reconstituted mixture). The term "purified" as used herein preferably means at least 80% by dry weight, more preferably in the range of 85% by weight, more preferably 95-99% by weight, and most preferably at least 99.8% by weight, of biological macromolecules of the same type present (but water, buffers, and other small molecules, especially molecules having a molecular weight of less than 5000, can be present). The term "pure" as used herein preferably has the same numerical limits as "purified" immediately above.

A "recombinant nucleic acid" is any nucleic acid that has been placed adjacent to another nucleic acid by recombinant DNA techniques. A "recombined nucleic acid" also includes any nucleic acid that has been placed next to a second nucleic acid by a laboratory genetic technique such as, for example, transformation, and integration, transposon hopping or viral insertion. In general, a recombinant nucleic acid is not naturally located adjacent to the second nucleic acid.

The term "recombinant protein" refers to a protein of the present application which is produced by recombinant DNA techniques, wherein generally DNA encoding the expressed protein is inserted into a suitable expression vector which is

in turn used to transform a host cell to produce the heterologous protein. Moreover, the phrase "derived from", with respect to a recombinant gene encoding the recombinant protein is meant to include within the meaning of "recombinant protein" those proteins having an amino acid sequence of a native protein, or an amino acid sequence similar thereto which is generated by mutations including substitutions and deletions of a naturally occurring protein.

A "RING domain" or "Ring Finger" is a zinc-binding domain with a defined octet of cysteine and histidine residues. Certain RING domains comprise the consensus sequences as set forth below (amino acid nomenclature is as set forth in Table 1): Cys Xaa Xaa Cys Xaa<sub>10 - 20</sub> Cys Xaa His Xaa<sub>2-5</sub> Cys Xaa Xaa Cys Xaa<sub>13-50</sub> Cys Xaa Xaa Cys or Cys Xaa Xaa Cys Xaa<sub>10 - 20</sub> Cys Xaa His Xaa<sub>2-5</sub> His Xaa Xaa Cys Xaa<sub>13-50</sub> Cys Xaa Xaa Cys. Certain RING domains are represented as amino acid sequences that are at least 80% identical to amino acids 12-52 of SEQ ID NO: 2 and is set forth in SEQ ID No: 26. Preferred RING domains are 85%, 90%, 95%, 98% and, most preferably, 100% identical to the amino acid sequence of SEQ ID NO: 26. Preferred RING domains of the application bind to various protein partners to form a complex that has ubiquitin ligase activity. RING domains preferably interact with at least one of the following protein types: F box proteins, E2 ubiquitin conjugating enzymes and cullins.

The term "RNA interference" or "RNAi" refers to any method by which expression of a gene or gene product is decreased by introducing into a target cell one or more double-stranded RNAs which are homologous to the gene of interest (particularly to the messenger RNA of the gene of interest). RNAi may also be achieved by introduction of a DNA:RNA hybrid wherein the antisense strand (relative to the target) is RNA. Either strand may include one or more modifications to the base or sugar-phosphate backbone. Any nucleic acid preparation designed to achieve an RNA interference effect is referred to herein as an siRNA construct. Phosphorothioate is a particularly common modification to the backbone of an siRNA construct.

"Small molecule" as used herein, is meant to refer to a composition, which has a molecular weight of less than about 5 kD and most preferably less than about 2.5 kD. Small molecules can be nucleic acids, peptides, polypeptides,

peptidomimetics, carbohydrates, lipids or other organic (carbon containing) or inorganic molecules. Many pharmaceutical companies have extensive libraries of chemical and/or biological mixtures comprising arrays of small molecules, often fungal, bacterial, or algal extracts, which can be screened with any of the assays of 5 the application.

An "SH3" or "Src Homology 3" domain is a protein domain of generally about 60 amino acid residues first identified as a conserved sequence in the non-catalytic part of several cytoplasmic protein tyrosine kinases (e.g., Src, Abl, Lck). SH3 domains mediate assembly of specific protein complexes via binding to 10 proline-rich peptides. Exemplary SH3 domains are represented by amino acids 137-192, 199-258, 448-505 and 832-888 of SEQ ID NO:2 and are set forth in SEQ ID Nos: 27-30. In certain embodiments, an SH3 domain interacts with a consensus sequence of RXaaXaaPXaaX<sub>6</sub>P (where X<sub>6</sub>, as defined in table 1 below, is a hydrophobic amino acid). In certain embodiments, an SH3 domain interacts with 15 one or more of the following sequences: P(T/S)AP, PFRDY, RPEPTAP, RQGPKEP, RQGPKEPFR, RPEPTAPEE and RPLPVAP.

As used herein, the term "specifically hybridizes" refers to the ability of a nucleic acid probe/primer of the application to hybridize to at least 12, 15, 20, 25, 20 30, 35, 40, 45, 50 or 100 consecutive nucleotides of a POSH sequence, or a sequence complementary thereto, or naturally occurring mutants thereof, such that it has less than 15%, preferably less than 10%, and more preferably less than 5% background hybridization to a cellular nucleic acid (e.g., mRNA or genomic DNA) other than the POSH gene. A variety of hybridization conditions may be used to detect specific hybridization, and the stringency is determined primarily by the wash 25 stage of the hybridization assay. Generally high temperatures and low salt concentrations give high stringency, while low temperatures and high salt concentrations give low stringency. Low stringency hybridization is achieved by washing in, for example, about 2.0 x SSC at 50 °C, and high stringency is achieved with about 0.2 x SSC at 50 °C. Further descriptions of stringency are provided 30 below.

As applied to polypeptides, "substantial sequence identity" means that two peptide sequences, when optimally aligned, such as by the programs GAP or

BESTFIT using default gap which share at least 90 percent sequence identity, preferably at least 95 percent sequence identity, more preferably at least 99 percent sequence identity or more. Preferably, residue positions which are not identical differ by conservative amino acid substitutions. For example, the substitution of 5 amino acids having similar chemical properties such as charge or polarity are not likely to effect the properties of a protein. Examples include glutamine for asparagine or glutamic acid for aspartic acid.

As is well known, genes for a particular polypeptide may exist in single or multiple copies within the genome of an individual. Such duplicate genes may be 10 identical or may have certain modifications, including nucleotide substitutions, additions or deletions, which all still code for polypeptides having substantially the same activity.

A "virion" is a complete viral particle; nucleic acid and capsid (and a lipid envelope in some viruses. A "viral particle" may be incomplete, as when produced 15 by a cell transfected with a defective virus (e.g., an HIV virus-like particle system).

Table 1: Abbreviations for classes of amino acids\*

Symbol	Category	Amino Acids Represented
X1	Alcohol	Ser, Thr
X2	Aliphatic	Ile, Leu, Val
Xaa	Any	Ala, Cys, Asp, Glu, Phe, Gly, His, Ile, Lys, Leu, Met, Asn, Pro, Gln, Arg, Ser, Thr, Val, Trp, Tyr
X4	Aromatic	Phe, His, Trp, Tyr
X5	Charged	Asp, Glu, His, Lys, Arg

X6	Hydrophobic	Ala, Cys, Phe, Gly, His, Ile, Lys, Leu, Met, Thr, Val, Trp, Tyr
X7	Negative	Asp, Glu
X8	Polar	Cys, Asp, Glu, His, Lys, Asn, Gln, Arg, Ser, Thr
X9	Positive	His, Lys, Arg
X10	Small	Ala, Cys, Asp, Gly, Asn, Pro, Ser, Thr, Val
X11	Tiny	Ala, Gly, Ser
X12	Turnlike	Ala, Cys, Asp, Glu, Gly, His, Lys, Asn, Gln, Arg, Ser, Thr
X13	Asparagine-Aspartate	Asn, Asp

\* Abbreviations as adopted from [http://smart.embl-heidelberg.de/SMART\\_DATA/alignments/consensus/grouping.html](http://smart.embl-heidelberg.de/SMART_DATA/alignments/consensus/grouping.html).

## 2. Overview

In certain aspects, the application relates to the discovery of novel associations between POSH proteins and other proteins (termed POSH-APs), and related methods and compositions. In certain aspects, the application relates to novel associations among certain disease states, POSH nucleic acids and proteins, and POSH-AP nucleic acids and proteins.

In certain aspects, by identifying proteins associated with POSH, and particularly human POSH, the present application provides a conceptual link between the POSH-APs and cellular processes and disorders associated with POSH-APs, and POSH itself. Accordingly, in certain embodiments of the disclosure, agents that modulate a POSH-AP may now be used to modulate POSH functions

and disorders associated with POSH function, such as viral disorders, POSH-associated cancers, and POSH-associated neural disorders. Additionally, test agents may be screened for an effect on a POSH-AP and then further tested for an effect on a POSH function or a disorder associated with POSH function. Likewise, in certain 5 embodiments of the disclosure, agents that modulate POSH may now be used to modulate POSH-AP functions and disorders associated with POSH-AP function, including a variety of cancers. Additionally, test agents may be screened for an effect on POSH and then further tested for effect on a POSH-AP function or a disorder associated with POSH-AP function. In further aspects, the application 10 provides nucleic acid agents (e.g., RNAi probes, antisense nucleic acids), antibody-related agents, small molecules and other agents that affect POSH function, and the use of same in modulating POSH and/or POSH-AP activity.

POSH intersects with and regulates a wide range of key cellular functions that may be manipulated by affecting the level of and/or activity of POSH 15 polypeptides or POSH-AP polypeptides. Many features of POSH, and particularly human POSH, are described in PCT patent publications WO03/095971A2 (application no. WO2002US0036366) and WO03/078601A2 (application no. WO2003US0008194) the teachings of which are incorporated by reference herein.

As described in the above-referenced publications, native human POSH is a 20 large polypeptide containing a RING domain and four SH3 domains. POSH is a ubiquitin ligase (also termed an "E3" enzyme); the RING domain mediates ubiquitination of, for example, the POSH polypeptide itself. POSH interacts with a large number of proteins and participates in a host of different biological processes. As demonstrated in this disclosure, POSH associates with a number of different 25 proteins in the cell. POSH co-localizes with proteins that are known to be located in the trans-Golgi network, implying that POSH participates in the trafficking of proteins in the secretory system. The term "secretory system" should be understood as referring to the membrane compartments and associated proteins and other molecules that are involved in the movement of proteins from the site of translation 30 to a location within a vacuole, a compartment in the secretory pathway itself, a lysosome or endosome or to a location at the plasma membrane or outside the cell. Commonly cited examples of compartments in the secretory system include the

endoplasmic reticulum, the Golgi apparatus and the cis and trans Golgi networks. In addition, Applicants have demonstrated that POSH is necessary for proper secretion, localization or processing of a variety of proteins, including phospholipase D, HIV Gag, HIV Nef, Rapsyn and Src. Many of these proteins are myristoylated, 5 indicating that POSH plays a general role in the processing and proper localization of myristoylated proteins. N-myristylation is an acylation process, which results in covalent attachment of myristate, a 14-carbon saturated fatty acid to the N-terminal glycine of proteins (Farazi et al., J. Biol. Chem. 276: 39501-04 (2001)). N-myristylation occurs co-translationaly and promotes weak and reversible protein- 10 membrane interaction. Myristoylated proteins are found both in the cytoplasm and associated with membrane. Membrane association is dependent on protein configuration, i.e., surface accessibility of the myristoyl group may be regulated by protein modifications, such as phosphorylation, ubiquitination etc. Modulation of intracellular transport of myristoylated proteins in the application includes effects on 15 transport and localization of these modified proteins.

As described herein, POSH and POSH-APs are involved in viral maturation, including the production, post-translational processing, assembly and/or release of proteins in a viral particle. Accordingly, viral infections may be ameliorated by inhibiting an activity (e.g., ubiquitin ligase activity or target protein interaction) of 20 POSH or a POSH-AP (e.g., inhibition of kinase activity or ubiquitin ligase activity), and in preferred embodiments, the virus is a retroid virus, an RNA virus or an envelope virus, including HIV, Ebola, HBV, HCV, HTLV, West Nile Virus (WNV) or Moloney Murine Leukemia Virus (MMuLV). Additional viral species are described in greater detail below. In certain instances, a decrease of a POSH 25 function is lethal to cells infected with a virus that employs POSH in release of viral particles.

In certain aspects, the application describes an hPOSH interaction with Rac, a small GTPase and the POSH associated kinases MLK, MKK and JNK. Rho, Rac and Cdc42 operate together to regulate organization of the actin cytoskeleton and the 30 MLK-MKK-JNK MAP kinase pathway (referred to herein as the “JNK pathway” or “Rac-JNK pathway” (Xu et al., 2003, EMBO J. 2: 252-61). Ectopic expression of mouse POSH (“mPOSH”) activates the JNK pathway and causes nuclear

localization of NF- $\kappa$ B. Overexpression of mPOSH in fibroblasts stimulates apoptosis. (Tapon et al. (1998) EMBO J. 17:1395-404). In *Drosophila*, POSH may interact with, or otherwise influence the signaling of, another GTPase, Ras. (Schnorr et al. (2001) Genetics 159: 609-22). The JNK pathway and NF- $\kappa$ B regulate a variety of key genes involved in, for example, immune responses, inflammation, cell proliferation and apoptosis. For example, NF- $\kappa$ B regulates the production of interleukin 1, interleukin 8, tumor necrosis factor and many cell adhesion molecules. NF- $\kappa$ B has both pro-apoptotic and anti-apoptotic roles in the cell (e.g., in FAS-induced cell death and TNF-alpha signaling, respectively). NF- $\kappa$ B is negatively regulated, in part, by the inhibitor proteins I $\kappa$ B $\alpha$  and I $\kappa$ B $\beta$  (collectively termed "I $\kappa$ B"). Phosphorylation of I $\kappa$ B permits activation and nuclear localization of NF- $\kappa$ B. Phosphorylation of I $\kappa$ B triggers its degradation by the ubiquitin system. In an additional embodiment, a POSH polypeptide promotes nuclear localization of NF- $\kappa$ B. In further embodiments, manipulation of POSH levels and/or activities may be used to manipulate apoptosis. By upregulating POSH or a POSH-AP, apoptosis may be stimulated in certain cells, and this will generally be desirable in conditions characterized by excessive cell proliferation (e.g., in certain cancers). By downregulating POSH or a POSH-AP, apoptosis may be diminished in certain cells, and this will generally be desirable in conditions characterized by excessive cell death, such as myocardial infarction, stroke, degenerative diseases of muscle and nerve (particularly Alzheimer's disease), and for organ preservation prior to transplant. In a further embodiment, a POSH polypeptide associates with a vesicular trafficking complex, such as a clathrin- or coatomer- containing complex, and particularly a trafficking complex that localizes to the nucleus and/or Golgi apparatus.

As described in WO03/078601A2 (application no. WO2003US0008194), POSH is overexpressed in a variety of cancers, and downregulation of POSH is associated with a decrease in proliferation in at least one cancer cell line. Accordingly, agents that modulate POSH itself or a POSH-AP may be used to treat POSH associated cancers. POSH associated cancers include those cancers in which POSH is overexpressed and/or in which downregulation of POSH leads to a

decrease in the proliferation or survival of cancer cells. POSH-associated cancers are described in more detail below. In addition, it is notable that many proteins shown herein to be affected by POSH downregulation are themselves involved in cancers. Phospholipase D and SRC are both aberrantly processed in a POSH-impaired cell, and therefore modulation of POSH and/or a POSH-AP may affect the wide range of cancers in which PLD and SRC play a significant role.

As described in WO03/095971A2 (application no. WO2002US0036366) and WO03/078601A2 (application no. WO2003US0008194), POSH polypeptides function as E3 enzymes in the ubiquitination system. Accordingly, downregulation or upregulation of POSH ubiquitin ligase activity can be used to manipulate biological processes that are affected by protein ubiquitination. Modulation of POSH ubiquitin ligase activity may be used to affect POSH-APs and related biological processes, and likewise, modulation of POSH-APs may be used to affect POSH ubiquitin ligase activity and related processes. Downregulation or upregulation may be achieved at any stage of POSH formation and regulation, including transcriptional, translational or post-translational regulation. For example, POSH transcript levels may be decreased by RNAi targeted at a POSH gene sequence. As another example, POSH ubiquitin ligase activity may be inhibited by contacting POSH with an antibody that binds to and interferes with a POSH RING domain or a domain of POSH that mediates interaction with a target protein (a protein that is ubiquitinated at least in part because of POSH activity). As a further example, small molecule inhibitors of POSH ubiquitin ligase activity are provided herein. As another example, POSH activity may be increased by causing increased expression of POSH or an active portion thereof. POSH, and POSH-APs that modulate POSH ubiquitin ligase activity may participate in biological processes including, for example, one or more of the various stages of a viral lifecycle, such as viral entry into a cell, production of viral proteins, assembly of viral proteins and release of viral particles from the cell. POSH may participate in diseases characterized by the accumulation of ubiquitinated proteins, such as dementias (e.g., Alzheimer's and Pick's), inclusion body myositis and myopathies, polyglucosan body myopathy, and certain forms of amyotrophic lateral sclerosis. POSH may

participate in diseases characterized by excessive or inappropriate ubiquitination and/or protein degradation.

3. POSH Associated Proteins

In certain aspects, the application relates to the discovery of novel associations between POSH proteins and other proteins (termed POSH-APs), and related methods and compositions. In certain aspects, the application relates to novel associations among certain disease states, POSH nucleic acids and proteins, and POSH-AP nucleic acids and proteins. POSH-APs may interact either directly or indirectly with POSH. In certain embodiments, a POSH-AP binds directly to a POSH polypeptide.

In certain aspects, the application relates to the discovery that a POSH polypeptide interacts with one subunit of Protein Kinase A (PKA; cAMP-dependent protein kinase). In one aspect, the application relates to the discovery that POSH binds directly with PRKAR1A. This interaction was identified by Applicants in a yeast 2-hybrid assay. Exemplary PKA subunits may include, but are not limited to, a regulatory subunit (e.g., PRKAR1A) and a catalytic subunit (e.g., PRKACA or PRKACB). PKA is an essential enzyme in the signaling pathway of the second messenger cyclic AMP (cAMP). Through phosphorylation of target proteins, PKA controls many biochemical events in the cell including regulation of metabolism, ion transport, and gene transcription. The PKA holoenzyme is composed of two regulatory and two catalytic subunits and dissociates from the regulatory subunits upon binding of cAMP. The PKA enzyme is inactive in the absence of cAMP. Activation of PKA occurs when two cAMP molecules bind to each regulatory subunit, eliciting a reversible conformational change that releases active catalytic subunits.

A number of human PKA subunits have been characterized, including a regulatory subunit (type I alpha: PRKAR1) and two catalytic subunits (C-alpha: PRKACA; and C-beta: PRKACB). Boshart et al. identified the regulatory subunit PRKAR1 of PKA as the product of the TSE1 locus (Boshart, M et al. (1991) Cell 30: 66: 849-859). The evidence consisted of concordant expression of PRKAR1 mRNA and TSE1 genetic activity, high resolution physical mapping of the two genes on human chromosome 17, and the ability of transfected PRKAR1 cDNA to generate a

phenocopy of TSE1-mediated extinction. Jones et al. independently established identity of TSE1 and the RI-alpha subunit (Jones, KW et al. (1991) Cell 66: 861-872).

Other than a role of PKA in metabolism, PKA subunits have recently been implicated in multiple diseases. For example, a specific role for localized PRKAR1 has been demonstrated in human T lymphocytes, where type I PKA localizes to the activated TCR complex and is required for attenuation of signals propagated through this complex (Skalhegg, BS et al. (1992) J Biol Chem 267:15707-15714; Skalhegg, BS et al. (1994) Science 263: 84-87). The importance of type I PKA-mediated effects in attenuation of T cell replication has led to its consideration as a therapeutic target in combined variable immunodeficiency (CVI) and acquired immune deficiency syndrome (AIDS). Furthermore, type I PKA in T cells may also serve as a potential therapeutic target in systemic lupus erythematosis (SLE). For example, a series of recently published articles has uncovered the first human disease mapping to a PKA subunit-Carney complex (Casey, M et al. (2000) J Clin Invest 106: R31-38; Kirschner, LS et al. (2000) Nat Genet 26: 89-92). Carney complex (CNC) is a multiple neoplasia syndrome characterized by spotty skin pigmentation, cardiac and skin myxomas, endocrine tumors, and psammomatous melanotic schwannomas. CNC maps to two genomic loci, 17q24 and 2p16. Familial cases mapping to the 17q24 locus reveal deletions/mutations in the PRKAR1 coding exons leading to frameshifts and premature stop codons—no mRNA and protein from the mutant alleles has been observed.

Accordingly, in certain aspects of the present disclosure, POSH participates in the formation of PKA complexes, including human PKA-containing complexes. Certain POSH polypeptides may be involved in disorders of the immune system, e.g., autoimmune disorders. Certain POSH polypeptides may be involved in the regulation of T-cell activation. In certain aspects, POSH participates in the ubiquitination of PI3K. In certain aspects, PKA subunit polypeptides participate in POSH-mediated processes.

Additionally, the disclosure relates in part to the discovery that PKA phosphorylates POSH, and further, that this phosphorylation inhibits the interaction of POSH with small GTPases, such as Rac. Small GTPases are important in

vesicular trafficking, and therefore the findings disclosed herein demonstrate that POSH phosphorylation regulates the formation of complexes between POSH and proteins involved in the secretory system, such as Rac, TCL, TC10, Cdc42, Wrch-1, Rac2, Rac3 or RhoG. Applicants have shown that inhibition of PKA and POSH has similar effects, indicating that inhibition of PKA will achieve an effect similar to that of inhibition of POSH. However, given the effect of PKA on POSH interaction with proteins in the secretory pathway, it is expected that PKA regulates the timing of cyclical interactions that are needed to effect vesicular trafficking. Accordingly, it is expected that significant inhibition or activation of PKA will cause a disruption 10 in POSH function.

The term "PKA subunit" is used herein to refer to a full-length human PKA subunit which includes a regulatory subunit (e.g., PRKAR1A) and a catalytic subunit (e.g., PRKACB or PRKACA), as well as an alternative PKA subunit composed of separate PKA subunit sequences (e.g., nucleic acid sequences) that 15 may be a splice variant. The term "PKA subunit" is used herein to refer as well to various naturally occurring PKA subunit homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring PKA subunit (e.g., SEQ ID NOS: 264-265, 111-122, 395-396). The term specifically includes human PKA subunit nucleic acid and amino 20 acid sequences and the sequences presented in Figure 36.

In certain aspects, the application relates to the discovery that a POSH polypeptide interacts with human UNC84B, a human homolog of *C. elegans* Unc-84. Accordingly, the application provides complexes comprising POSH and UNC84B. In one aspect, the application relates to the discovery that POSH binds 25 directly with UNC84B. This interaction was identified by Applicants in a yeast 2-hybrid assay. In *C. elegans*, Unc-84 is involved in the cellular positioning of the nucleus. UNC84/SUN is positioned at the nuclear membrane and recruits Syne/ANC-1, which directly tethers the nuclear envelope to the actin cytoskeleton. Accordingly, in certain aspects, POSH participates in formation of a UNC84 30 complexes, including human UNC84B-containing complexes, and in the connections between the nucleus and the cytoskeleton. In certain aspects, UNC84

polypeptides participate in POSH-mediated processes. See, for example, Starr and Han, 2003, J Cell Sci 116(Pt 2):211-6.

The term UNC84 is used herein to refer to various naturally occurring UNC84 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring UNC84 (e.g., SEQ ID NOs: 314, 211-213). The term specifically includes human UNC84B nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain aspects, the application relates to the discovery that a POSH polypeptide interacts with human GOCAP1. Certain GOCAP1 polypeptides are cytoplasmic proteins associated with the Golgi complex. Accordingly, the application provides complexes comprising POSH and GOCAP1. In one aspect, the application relates to the discovery that POSH binds directly with GOCAP1. This interaction was identified by Applicants in a yeast 2-hybrid assay. In certain aspects, these complexes associate with the Golgi complex. GOCAP1 is synonymous with GCP60. Certain GCP60 polypeptides interact with the Golgi complex integral membrane protein, giantin. Certain GCP60 polypeptides are involved in the maintenance of the Golgi structure through interaction with giantin and affect protein transport between the endoplasmic reticulum and the Golgi complex (Sohda, M, et al. (2001) J Biol Chem 276:45298-306). In certain aspects, GOCAP1 polypeptides participate in POSH-mediated processes.

The term GOCAP1 is used herein to refer to various naturally occurring GOCAP1 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring GOCAP1 (e.g., SEQ ID NOs: 240-243, 61-68). The term specifically includes human GOCAP1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain aspects, the application relates to the discovery that a POSH polypeptide interacts with human PTPN12, a protein tyrosine phosphatase. Accordingly, the application provides complexes comprising POSH and PTPN12. In one aspect, the application relates to the discovery that POSH binds directly with PTPN12. This interaction was identified by Applicants in a yeast 2-hybrid assay.

PTPN12 polypeptides are synonymous with the protein tyrosine phosphatase, PTP-PEST. PTP-PEST polypeptides contain proline-rich sequences and are rich in proline, glutamate, serine, and threonine residues at their carboxyl terminus, features characteristic of PEST motifs. Certain PTP-PEST polypeptides interact with 5 paxillin, a scaffolding protein to which focal adhesion proteins bind, leading to the formation of the focal adhesion contact (Shen, Y et al. (1998) J Biol Chem 273:6474-81). Certain PTP-PEST polypeptides associate with the focal adhesion protein, p130cas (Garton, AJ et al. (1997) Oncogene 15:877-85). Certain PTP-PEST polypeptides have also been shown to associate with JAK2, PSTPIP and 10 WASP, gelsolin, cell adhesion kinase beta, Csk, Hef 1 or Sin , Hic-5, or Shc (See, for example, Horsch, et al (2001) Mol Endocrinol 15:2182-96; Cote, et al (2002) J Biol Chem 277:2973-86; Chellaiah, et al (2001) J Biol Chem 276:47434-44; Lyons, et al (2001) J Biol Chem 276:24422-31; Davidson, et al (1997) J Biol Chem 21:1077-88; Cote, JF et al (1998) Biochemistry 37:13128-37; Nishiya, N (1999) J 15 Biol Chem 274:9847-53; Habib, T et al (1994) J Biol Chem 269:25243-6). Certain PTP-PEST polypeptides are involved in inactivation of the Ras pathway (Davidson, D and Veillette, A (2001) EMBO J 20:3414-26). The expression level of certain PTP-PEST polypeptides can modulate the activity of the GTPase, Rac1 (Sastry, et al (2002) J Cell Sci 115(Pt 22): 4305-16). Certain PTP-PEST polypeptides are 20 involved in the regulation of cell motility (Garton, AJ and Tonks, NK (1999) J Biol Chem 274:3811-8; Angers-Loustau, et al (1999) J Cell Biol 144:1019-31; and Sastry, et al. (2002) J Cell Sci 155(Pt 22): 4305-16). Accordingly, certain POSH polypeptides are involved in inactivation of the Ras pathway. Certain POSH polypeptides are involved in the regulation of cell motility.

25 Certain PTP-PEST polypeptides are involved in amyloid $\beta$ -induced neuronal dystrophy, a pathological hallmark of Alzheimer's disease (Grace, EA and Busciglio, J (2003) J Neurosci. 23:493-502). Accordingly, certain POSH polypeptides may be involved in Alzheimer's disease. Certain PTP-PEST polypeptides function as negative regulators of lymphocyte activation (Davidson, D 30 and Veillette, A (2001) EMBO J 20:3414-26). Accordingly, certain POSH polypeptides may be involved in the regulation of lymphocyte activation. In certain aspects, PTPN12 polypeptides participate in POSH-mediated processes.

The term PTPN12 is used herein to refer to various naturally occurring PTPN12 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring PTPN12 (e.g., SEQ ID NOs: 266-268, 123-129). The term specifically includes human 5 PTPN12 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain aspects, the application relates to the discovery that a POSH polypeptide interacts with HERPUD1, a “homocysteine-inducible, endoplasmic reticulum stress-inducible, ubiquitin-like domain member 1” protein. Accordingly, 10 the application provides complexes comprising POSH and HERPUD1. In one aspect, the application relates to the discovery that POSH binds directly with HERPUD1. This interaction was identified by Applicants in a yeast 2-hybrid assay. HERPUD1 is synonymous with Herp. In part, the present application relates to the discovery that a POSH-AP, HERPUD1, is involved in the maturation of an envelope 15 virus, such as HIV.

Certain HERPUD1 polypeptides are involved in JNK-mediated apoptosis, particularly in vascular endothelial cells, including cells that are exposed to high levels of homocysteine. Certain HERPUD1 polypeptides are involved in the Unfolded Protein Response, a cellular response to the presence of unfolded proteins 20 in the endoplasmic reticulum. Certain HERPUD1 polypeptides are involved in the regulation of sterol biosynthesis. Accordingly, certain POSH polypeptides are involved in the Unfolded Protein Response and sterol biosynthesis.

In other aspects, certain HERPUD1 polypeptides enhance presenilin-mediated amyloid  $\beta$ -protein generation. For example, HERPUD1 polypeptides, 25 when overexpressed in cells, increase the level of amyloid  $\beta$  generation, and it is observed that HERPUD1 polypeptides interact with the presenilin proteins, presenilin-1 and presenilin-2. (See Sai, X. et al (2002) J. Biol. Chem. 277:12915-12920). Accordingly, in certain aspects, POSH polypeptides may modulate the level 30 of amyloid  $\beta$  generation. Additionally, POSH polypeptides may interact with presenilin 1 and presenilin 2. Therefore, it is believed certain POSH polypeptides modulate presenilin-mediated amyloid  $\beta$  generation. The accumulation of amyloid 9372369\_1

$\beta$  is one hallmark of Alzheimer's disease. Accordingly, these POSH polypeptides may be involved in the pathogenesis of Alzheimer's disease. At sites such as late intracellular compartment sites including the trans-Golgi network, certain mutant presenilin-2 polypeptides up-regulate production of amyloid  $\beta$  peptides ending at 5 position 42 (A $\beta$ 42). (See Iwata, H. et al (2001) J. Biol. Chem. 276: 21678-21685). Accordingly, POSH polypeptides regulate production of A $\beta$ 42 through mutant presenilin-2 at late intracellular compartment sites including the trans-Golgi network. Furthermore, elevated homocysteine levels have been found to be a risk factor associated with Alzheimer's disease and cerebral vascular disease. Some risk 10 factors, such as elevated plasma homocysteine levels, may accelerate or increase the severity of several central nervous system (CNS) disorders. Elevated levels of plasma homocysteine were found in young male patients with schizophrenia suggesting that elevated homocysteine levels could be related to the pathophysiology of aspects of schizophrenia (Levine, J. et al (2002) Am. J. Psychiatry 159:1790-2). Accordingly, certain POSH polypeptides may be involved 15 in neurological disorders. Neurological disorders include disorders associated with increased levels of plasma homocysteine, increased levels of amyloid  $\beta$  production, or aberrant presenilin acitivity. Neurological disorders include CNS disorders, such as Alzheimer's disease, cerebral vascular disease and schizophrenia. Certain POSH 20 polypeptides may be involved in cardiovascular diseases, such as thromboembolic vascular disease, and particularly the disease characteristics associated with hyperhomocysteinemia. See, for example, Kokame et al. 2000 J. Biol. Chem. 275:32846-53; Zhang et al. 2001 Biochem Biophys Res Commun 289:718-24.

The term HERPUD1 is used herein to refer to various naturally occurring 25 HERPUD1 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring HERPUD1 (e.g., SEQ ID NOs: 249-252, 77-86). The term specifically includes human HERPUD1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

30 In certain aspects, the application relates to the discovery that a POSH polypeptide interacts with one or more Cbl-b polypeptides. Accordingly, the 9372369\_1

application provides complexes comprising POSH and Cbl-b. In one aspect, the application relates to the discovery that POSH binds directly with Cbl-b. This interaction was identified by Applicants in a yeast 2-hybrid assay. Cbl-b polypeptides contain an amino-terminal variant SH2 domain, a RING finger, and a carboxyl-terminal proline-rich domain with potential tyrosine phosphorylation sites.

5 Cbl-b is highly homologous to the mammalian Cbl and the nematode Sli-1 proteins. This application provides four Cbl-b variants and shows that the POSH polypeptide interacts with one or more of these variants. In one aspect, the POSH polypeptide interacts with a human Cbl-b (UniGene No.: Hs.3144). In another aspect, the POSH

10 polypeptide interacts with an alternative human Cbl-b (UniGene No.: Hs.381921) that may be a splice variant of Cbl-b. In yet another aspect, the POSH polypeptide interacts with a human Cbl-b polypeptide that is a splice variant represented by the amino acid sequence depicted in SEQ ID NO: 361, which is encoded by the nucleic acid sequence depicted in SEQ ID NO: 359. In yet another aspect, the POSH

15 polypeptide interacts with a human Cbl-b polypeptide that is a splice variant represented by the amino acid sequence depicted in SEQ ID NO: 398, which is encoded by the nucleic acid sequence depicted in SEQ ID NO: 360.

Certain Cbl-b polypeptides have been shown to function as adaptor proteins by interacting with other signaling molecules, e.g., interaction with cell surface receptor tyrosine kinases, e.g., EGFR (Ettenberg, SA et al (2001) J Biol Chem 276:77-84) or with proteins such as Syk (Elly, C et al (1999) Oncogene 18:1147-56), Crk-L (Elly, C et al (1999) Oncogene 18:1147-56), PI3K (Fang, D et al. (2001) J Biol Chem 16:4872-8), Grb2 (Ettenberg, SA et al (1999) Oncogene 18:1855-66), or Vav (Bustelo, XR et al. (1997) Oncogene 15:2511-20). Certain Cbl-b polypeptides have been demonstrated to interact directly with the nucleotide exchange factor, Vav (Bustelo, XR et al. (1997) Oncogene 15:2511-20). Certain Cbl-b polypeptides have been shown to function as an E3 ubiquitin ligase that recognizes tyrosine phosphorylated substrates through its SH2 domain and through its RING domain, recruits a ubiquitin-conjugating enzyme, E2 (Joazeiro, C et al. (1999) Science 286:309-312) Additionally, certain Cbl-b polypeptides have been shown to associate directly with the p85 subunit of PI3K and to function as an E3 ligase in the ubiquitination of PI3K (Fang, D et al. (2001) J Biol Chem 16:4872-8).

Certain Cbl-b polypeptides are negative regulators of T-cell activation. Cbl-b-deficient mice become very susceptible to experimental autoimmune encephalomyelitis (Chiang, YJ et al. (2000) Nature 403:216-220). Also, Cbl-b-deficient mice develop spontaneous autoimmunity (Bachmaier, K, et al (2000) Nature 403:211-216). Furthermore, Cbl-b is a major susceptibility gene for rat type 5 diabetes mellitus (Yokoi, N et al (2002) Nature Genet. 31:391-394).

Accordingly, in certain aspects, POSH participates in the formation of Cbl-b complexes, including human Cbl-b-containing complexes. Certain POSH polypeptides may be involved in disorders of the immune system, e.g., autoimmune 10 disorders. Certain POSH polypeptides may be involved in the regulation of T-cell activation. In certain aspects, POSH participates in the ubiquitination of PI3K. In certain aspects, Cbl-b polypeptides participate in POSH-mediated processes.

The term Cbl-b is used herein to refer to full-length, human Cbl-b (UniGene No.: Hs.3144) as well as an alternative Cbl-b (UniGene No.: Hs.381921) composed of two separate Cbl-b sequences (e.g., nucleic acid sequences) that may be a splice variant. The term Cbl-b is used herein to refer as well to the human Cbl-b splice variant represented by the amino acid sequence of SEQ ID NO: 361, which is encoded by the nucleic acid sequence of SEQ ID NO: 359 and to the human Cbl-b splice variant represented by the amino acid sequence of SEQ ID NO: 398, which is 15 encoded by the nucleic acid sequence of SEQ ID NO: 360. The term Cbl-b is used herein to refer as well to various naturally occurring Cbl-b homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring Cbl-b (e.g., SEQ ID NOs: 361, 398, 227-230, 353-360 ). The term specifically includes human Cbl-b nucleic acid and 20 amino acid sequences and the sequences presented in Figure 36.

In certain embodiments, the application relates to the discovery that a POSH polypeptide interacts with GOSR2. Accordingly, the application provides complexes comprising POSH and GOSR2. In one aspect, the application relates to the discovery that POSH binds directly with GOSR2. This interaction was 25 identified by Applicants in a yeast 2-hybrid assay. Certain GOSR2 polypeptides are synonymous with GS27 (for Golgi SNARE of 27K) and are involved in trafficking membrane proteins between the endoplasmic reticulum and the Golgi and between

Golgi subcompartments such as between the cis-, medial- and trans-Golgi network. (See, for example, Lowe, SL et al (1997) Nature 389:881-4 and Bui, TD et al (1999) 57:285-8). Accordingly, certain POSH polypeptides are involved in the trafficking of membrane proteins between the endoplasmic reticulum and the Golgi and 5 between Golgi subcompartments.

The term GOSR2 is used herein to refer to various naturally occurring GOSR2 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring GOSR2 (e.g., SEQ ID NOS: 244-248, 69-76). The term specifically includes human GOSR2 10 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain embodiments, the application relates to the discovery that a POSH polypeptide interacts with RALA. Accordingly, the application provides complexes comprising POSH and RALA. In one aspect, the application relates to the discovery that POSH binds directly with RALA. This interaction was identified by Applicants 15 in a yeast 2-hybrid assay. RALA polypeptides are GTP-binding polypeptides. RALA polypeptides are members of the Ras family of proteins and are GTPases. Certain RALA polypeptides may be synonymous with RalA polypeptides. RalA polypeptides are small GTPases. RalA polypeptides have been shown to interact with phospholipase D and to effect phospholipase D activity. Additionally, RalA 20 polypeptides may be involved in tumor formation and cell transformation. (See, for example, Kim, JH et al (1998) FEBS Lett 430:231-5; Aguirre-Ghiso, JA et al (1999) Oncogene 18:4718-25; Lu, Z et al (2000) Mol Cell Biol 20:462-7; Gildea, JJ et al (2002) Cancer Res 62:982-5; Lucas, L et al (2002) Int J Oncol 21:477-85; and Xu, L 25 et al (2003) Mol Cell Biol 23:645-54). Accordingly, certain POSH polypeptides may interact with PLD and modulate its activity, and certain POSH polypeptides may be involved in tumor formation and cell transformation. In other aspects, certain RalA polypeptides interact with calmodulin and may be involved in calcium/calmodulin-mediated intracellular signaling pathways (Clough, RR et al (2002) J Biol Chem 277:28972-80). Certain RalA polypeptides are involved in 30 controlling actin cytoskeletal remodeling and vesicle transport in mammalian cells. Certain RalA polypeptides interact with the exocyst complex, which is involved in exocytosis. (See, for example, Sugihara, K et al (2002) Nat Cell Biol 4:73-8; Polzin,

A et al (2002) Mol Cell Biol 22:1714-22; and Lipschutz, JH and Mostov, KE (2002) Curr Biol 12(6):R212-4). Accordingly, certain POSH polypeptides are involved in vesicle transport.

The term RALA is used herein to refer to various naturally occurring RALA homologs, as well as functionally similar variants and fragments that retain at least 5 80%, 90%, 95%, or 99% sequence identity to a naturally occurring RALA (e.g., SEQ ID NOS: 269-270, 130-134). The term specifically includes human RALA nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain embodiments, the application relates to the discovery that a POSH 10 polypeptide interacts with SMN1. Accordingly, the application provides complexes comprising POSH and SMN1. In one aspect, the application relates to the discovery that POSH binds directly with SMN1. This interaction was identified by Applicants in a yeast 2-hybrid assay. SMN1 polypeptides are encoded by the nucleic acid of the survival motor neuron gene 1 (SMN1). Mutations in this gene (such as its 15 homozygous absence) cause spinal muscular atrophy (SMA), a common autosomal recessive disorder characterized by degeneration of motor neurons in the spinal cord, leading to progressive paralysis with muscular atrophy. Accordingly, POSH may be involved in the pathogenesis of SMA. SMN1 is part of a multiprotein complex that is required for biogenesis of the Sm class of small nuclear ribonucleoproteins (Sm 20 snRNPs). SMN1 associates with a number of proteins, such as Gemin2 to Gemin6, to form a large complex found in both the cytoplasm and in the nucleus. SMN1 also associates with Snurportin 1, an adaptor protein that recognizes the nuclear localization signal of Sm snRNPs. (See, for example, Lefebvre, S et al (1995) Cell 80:155-65; Narayanan, U et al (2002) Hum Mol Genet 11:1785-95; Massenet, S et al 25 (2002) 22:6533-41; and Monani, UR et al (1999) Hum Mol Genet 8:1177-83). Accordingly, certain POSH polypeptides may be involved in the biogenesis of snRNPs. Certain SMN1 polypeptides interact with the large nonstructural protein NS1 of the autonomous parvovirus minute virus of mice (MVM). NS1 is essential 30 for viral replication, and it is a potent transcriptional activator (Young, PJ et al (2002) J Virol 76:3892-904). Certain SMN1 polypeptides interact with the protein NS2 of MVM. NS2 is also required for efficient viral replication. Certain SMN1 polypeptides colocalize with NS2 in infected nuclei and at late times following

MVM infection. (See Young, PJ et al (2002) J Virol 76:6364-9). Accordingly, POSH polypeptides are involved in viral replication.

The term SMN1 is used herein to refer to various naturally occurring SMN1 homologs, as well as functionally similar variants and fragments that retain at least 5 80%, 90%, 95%, or 99% sequence identity to a naturally occurring SMN1 (e.g., SEQ ID NOS: 273-275, 142-146). The term specifically includes human SMN1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain embodiments, the application relates to the discovery that a POSH polypeptide interacts with SMN2. Accordingly, the application provides complexes 10 comprising POSH and SMN2. In one aspect, the application relates to the discovery that POSH binds directly with SMN2. This interaction was identified by Applicants in a yeast 2-hybrid assay. The SMN2 gene is an almost identical copy of the SMN1 gene that causes SMA. A critical difference between the two genes is a 1 nucleotide base change inside exon 7 that affects the splicing pattern of the genes. The 15 majority of the SMN2 transcript lacks exon 7. Certain SMN2 polypeptides influence the severity of SMA. (See, for example, Monani, UR et al (1999) Hum Mol Genet 8: 1177-83; Cartegni, L and Krainer, AR (2002) Nat Genet 30:377-84; and Feldkotter, M et al (2002) Am J Hum Genet 70: 358-68). Accordingly, certain POSH polypeptides may influence the severity of SMA.

The term SMN2 is used herein to refer to various naturally occurring SMN2 homologs, as well as functionally similar variants and fragments that retain at least 20 80%, 90%, 95%, or 99% sequence identity to a naturally occurring SMN2 (e.g., SEQ ID NOS: 276-280, 147-151). The term specifically includes human SMN2 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain aspects, the application relates to the discovery that a POSH polypeptide interacts with SIAH1. Accordingly, the application provides complexes 25 comprising POSH and SIAH1. In one aspect, the application relates to the discovery that POSH binds directly with SIAH1. This interaction was identified by Applicants in a yeast 2-hybrid assay. Certain SIAH1 polypeptides bind ubiquitin-conjugating enzymes and target proteins for proteasome-mediated degradation. Certain SIAH1 30 polypeptides are involved in targeting beta-catenin for degradation (Matsuzawa, S and Reed, JC (2001) Molec Cell 7: 915-926 and Liu, J et al (2001) Molec Cell 7: 9372369\_1

927-936). Accordingly, certain POSH polypeptides are involved in the targeting of beta-catenin for degradation. Certain SIAH1 polypeptides are E3 ubiquitin ligases and regulate the ubiquitination and degradation of synaptophysin (Wheeler, TC et al. (2002) J Biol Chem 277: 10273-92). Accordingly, certain POSH polypeptides are involved in the ubiquitination and degradation of synaptophysin. Certain SIAH1 polypeptides regulate the protein, DCC (deleted in colorectal cancer), via the ubiquitin-proteosome pathway (Hu, G et al. (1997) Genes Dev 11: 2701-14). Accordingly, certain POSH polypeptides are involved in the ubiquitination and degradation of DCC. Certain SIAH1 polypeptides are a target of activation of p53 and are upregulated by p53, and certain SIAH1 polypeptides are involved in apoptosis, tumor suppression, as well as vertebrate development (Maeda, A et al (2002) FEBS Lett 512: 223-226; Hu, G et al (1997) Genomics 46:103-111; and Nemani, M et al (1996) Proc Natl Acad Sci USA 93: 9039-9042). Accordingly, certain POSH polypeptides may be a target of p53 activation, and certain POSH polypeptides may be involved in apoptosis and tumor suppression.

The term SIAH1 is used herein to refer to various naturally occurring SIAH1 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring SIAH1 (e.g., SEQ ID NOs: 271-272, 135-141). The term specifically includes human SIAH1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain embodiments, the application relates to the discovery that a POSH polypeptide interacts with SYNE1. Accordingly, the application provides complexes comprising POSH and SYNE1. In one aspect, the application relates to the discovery that POSH binds directly with SYNE1. This interaction was identified by Applicants in a yeast 2-hybrid assay. SYNE1 polypeptides are synonymous with Syne-1, myne-1, and nesprin-1 polypeptides. Syne-1 polypeptides are associated with nuclear envelopes in skeletal, cardiac, and smooth muscle cells. Syne-1 polypeptides contain multiple spectrin repeats. In muscle, myne-1 expression is observed in the inner nuclear envelope, and myne-1 has been shown to interact with the inner nuclear membrane protein lamin A/C. Syne-1 also associates with the nuclear envelope protein, emerin. Syne-1 polypeptides may be involved in maintaining nuclear organization and structural integrity, and certain Syne-1

polypeptides may be involved in the migration of myonuclei in myotubes and/or their anchoring at the postsynaptic apparatus. (See, for example, Apel et al (2000) J Biol Chem 275:31986-95; Zhang, Q et al (2001) J Cell Sci 114:4485-98; Zhang, Q et al (2002) Genomics 80:473-81; and Mislow, JM et al (2002) J Cell Sci 115 (Pt 1):61-70). Accordingly, certain POSH polypeptides may interact with the lamin A/C polypeptides and/or emerin polypeptides. Also, certain POSH polypeptides may be involved in maintaining nuclear organization and structural integrity, and certain POSH polypeptides may be involved in the migration of myonuclei in myotubes and/or their anchoring at the postsynaptic apparatus.

The term SYNE1 is used herein to refer to various naturally occurring SYNE1 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring SYNE1 (e.g., SEQ ID NOS: 295-307, 183-201). The term specifically includes human SYNE1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain embodiments, the application relates to the discovery that a POSH polypeptide interacts with TTC3. Accordingly, the application provides complexes comprising POSH and TTC3. In one aspect, the application relates to the discovery that POSH binds directly with TTC3. This interaction was identified by Applicants in a yeast 2-hybrid assay. Certain TTC3 polypeptides are synonymous with the proteins, TPRDI, TPRDII, TRPDIII, TPRD and DCRR1 and may be involved in the pathogenesis of certain characteristics of Down syndrome, such as morphological features, hypotonia, and mental retardation (Tsukahara, F et al (1996) J Biochem (Tokyo) 120: 820-827; Ohira, M et al (1996) DNA Res 3: 9-16; Dahmane, N et al (1998) Genomics 48: 12-23; and Eki, T et al (1997) DNA Seq 7:153-164).

The term TTC3 is used herein to refer to various naturally occurring TTC3 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring TTC3 (e.g., SEQ ID NOS: 308-312, 202-207). The term specifically includes human TTC3 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain embodiments, the application relates to the discovery that a POSH polypeptide interacts with VCY2IP1. Accordingly, the application provides

complexes comprising POSH and VCY2IP1. In one aspect, the application relates to the discovery that POSH binds directly with VCY2IP1. This interaction was identified by Applicants in a yeast 2-hybrid assay. VCY2IP1 is synonymous with VCY2IP-1, which has been shown to interact with the testis-specific protein, VCY2.

5 VCY2IP1 is also synonymous with C19orf5, which has been shown to interact with the tumor suppressor, RASSF1, suggesting a role for C19orf5 in apoptosis and tumor suppression (In Vitro Cell Dev Biol Anim (2002) 38:582-94). C19orf5 also demonstrates a strong homology to microtubule-associated proteins (Genomics (2002) 79:124-6). Accordingly, POSH may play a role in apoptosis and tumor suppression.

10 The term VCY2IP1 is used herein to refer to various naturally occurring VCY2IP1 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring VCY2IP1 (e.g., SEQ ID NOS: 315-323, 214-222). The term specifically includes 15 human VCY2IP1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain aspects, the application relates to the discovery that a POSH polypeptide interacts with MSTP028. In one aspect, the application relates to the discovery that POSH binds directly with MSTP028. This interaction was identified 20 by Applicants in a yeast 2-hybrid assay. In part, the present application relates to the discovery that a POSH-AP, MSTP028, is involved in the maturation of an envelope virus, such as HIV. Certain MSTP028 polypeptides contain one or more BTB/POZ domains that are generally involved in dimerization. Accordingly the application provides complexes comprising POSH and MSTP028, optionally in a dimeric form. 25 The term MSTP028 is used herein to refer to various naturally occurring MSTP028 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring MSTP028 (e.g., SEQ ID NOS: 255-256, 90-94). The term specifically includes human MSTP028 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

30 In certain embodiments, the application relates to the discovery that a POSH polypeptide interacts with SNX1. Accordingly, the application provides complexes comprising POSH and SNX1. In one aspect, the application relates to the discovery

that POSH binds directly with SNX1. This interaction was identified by Applicants in a yeast 2-hybrid assay. SNX1 is a member of the sorting nexin (SNX) protein family, which is implicated in regulating membrane traffic. SNX1 is a membrane associated protein that has been shown to be involved with targeting receptors to lysosomal degradation. SNX1 has been shown to bind to the C-terminal tail of the D5 dopamine receptor (*Mol Cell Biol* (1998) 18: 7278-87). Accordingly, in certain aspects POSH may associate with the D5 dopamine receptor. SNX1 is involved in regulating the targeting of internalized epidermal growth factor receptors for lysosomal degradation (*Science* (1996) 272:1008-1010). In certain aspects, POSH may be involved in targeting proteins for degradation to the lysosome. SNX1 has also been found to be involved in sorting PAR1, a G-protein coupled receptor for thrombin (*Mol Cell Biol* (2002) 13:1965-76). It has further been demonstrated that SNX1 functions in regulating trafficking in the endosome compartment via recognition of phosphorylated phosphatidylinositol through the phox homology domain (PX domain) of SNX1 (*Proc Natl Acad Sci* (2002) 99:6767-72).

The term SNX1 is used herein to refer to various naturally occurring SNX1 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring SNX1 (e.g., SEQ ID NOs: 281-286, 152-161). The term specifically includes human SNX1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In additional embodiments, the application relates to the discovery that a POSH polypeptide interacts with SNX3. Accordingly, the application provides complexes comprising POSH and SNX3. In one aspect, the application relates to the discovery that POSH binds directly with SNX3. This interaction was identified by Applicants in a yeast 2-hybrid assay. SNX3 is also a member of the SNX protein family. SNX3 has been shown to associate with the early endosome through its PX domain, a domain capable of interaction with phosphatidylinositol-3-phosphate (*Nat Cell Biol* (2002) 3:658-66). Accordingly, POSH may be involved in membrane traffic at the early endosome.

The term SNX3 is used herein to refer to various naturally occurring SNX3 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring SNX3 (e.g., SEQ

ID NOS: 287-290, 162-174). The term specifically includes human SNX3 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In further embodiments, the application relates to the discovery that a POSH polypeptide interacts with ATP6V0C. Accordingly, the application provides complexes comprising POSH and ASTP6V0C. In one aspect, the application relates to the discovery that POSH binds directly with ATP6V0C. This interaction was identified by Applicants in a yeast 2-hybrid assay. ATP6V0C, vacuolar-H(+)ATPase, is a large multimeric protein composed of at least twelve distinct subunits and it is involved in the H(+) transport across cellular membranes. ATP6V0C is synonymous with ATP6L. Treatment with anticancer agents has been shown to enhance ATP6L expression (Cytogenet Genome Res (2002) 97:111-5; J Biol Chem (2002) 277:36534-43).

The term ATP6V0C is used herein to refer to various naturally occurring ATP6V0C homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring ATP6V0C (e.g., SEQ ID NOs: 225-226, 345-351). The term specifically includes human ATP6V0C nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain aspects, the application relates to the discovery that a POSH polypeptide interacts with PPP1CA. Accordingly, the application provides complexes comprising POSH and PPP1CA. In one aspect, the application relates to the discovery that POSH binds directly with PPP1CA. This interaction was identified by Applicants in a yeast 2-hybrid assay. PPP1CA is the protein phosphatase type 1 alpha catalytic subunit. The genetic and expression status of the PPP1CA gene was examined in 55 human cancer cell lines and found to be ubiquitously expressed and lacking in genetic variation, suggesting an essential role for PPP1CA in the growth of cancer cells (Int J Oncol (2001) 18:817-24).

The term PPP1CA is used herein to refer to various naturally occurring PPP1CA homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring PPP1CA (e.g., SEQ ID NOs: 261-263, 101-110). The term specifically includes human

PPP1CA nucleic acid and amino acid sequences and the sequences presented in Figure 36.

The application further relates to the discovery that a POSH polypeptide interacts with DDEF1. Accordingly, the application provides complexes comprising 5 POSH and DDEF1. In one aspect, the application relates to the discovery that POSH binds directly with DDEF1. This interaction was identified by Applicants in a yeast 2-hybrid assay. DDEF1 is a putative candidate gene associated with Meckel-Gruber syndrome (MKS), the most common monogenic cause of neural tube defects (Hum Genet (2002) 111:654-61).

10 The term DDEF1 is used herein to refer to various naturally occurring DDEF1 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring DDEF1 (e.g., SEQ ID NOs: 233-237, 48-54). The term specifically includes human DDEF1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

15 In certain embodiments, the application relates to the discovery that a POSH polypeptide interacts with PACS-1. Accordingly, the application provides complexes comprising POSH and PACS-1. In one aspect, the application relates to the discovery that POSH binds directly with PACS-1. This interaction was identified by Applicants in a yeast 2-hybrid assay. PACS-1 is a cytosolic sorting 20 protein that directs localization of membrane proteins in the TGN/endosomal system. PACS-1 is a cytosolic protein involved in controlling the correct subcellular localization of integral membrane proteins that contain acidic cluster sorting motifs, such as furin and HIV-1 Nef, and PACS-1 has been shown to interact with the adaptor complexes AP-1 and AP-3 (EMBO J (2003) 22:6234-44; EMBO J (2001) 25 20:2191-201). Furthermore, PACS-1 polypeptides have been shown to interact with Nef and through this interaction, by a PI3K-dependent process, MHC class I molecules are downregulated by Nef (Cell (2002) 11:853-66). Accordingly, POSH may be involved in Nef-mediated downregulation of MHC class I molecules in a cell infected with HIV-1. Additionally, PACS-1 interacts with the HIV-1 protein, 30 Vpu. Vpu expresses an acidic amino acid sorting motif that is required for TGN localization through a retroviral process mediated by PACS-1 (Wan, L et al (1998)

Cell 94:205-216). Accordingly, in certain aspects, POSH may associate with Vpu through its interaction with PACS-1.

The term PACS-1 is used herein to refer to various naturally occurring PACS-1 homologs, as well as functionally similar variants and fragments that retain 5 at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring PACS-1 (e.g., SEQ ID NOS: 362-366, 95-100). The term specifically includes human PACS-1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain aspects, the application relates to the discovery that a POSH polypeptide interacts with EPS8L2. Accordingly, the application provides 10 complexes comprising POSH and EPS8L2. In one aspect, the application relates to the discovery that POSH binds directly with EPS8L2. This interaction was identified by Applicants in a yeast 2-hybrid assay. EPS8L2 is an eps8-related protein. Eps8 forms a multimeric complex with Sos-1, Abi1 and PI3K that is required for Rac activation leading to actin remodelling. EPS8L2 has been shown to 15 interact with Abi1 and Sos-1. EPS8L2 also has been shown to localize to PDGF-induced F-actin-rich ruffles and to restore receptor tyrosine kinase mediated actin remodeling when expressed in eps8-/- fibroblasts (Mol Biol Cell (2004) 15:91-8).

The term EPS8L2 is used herein to refer to various naturally occurring EPS8L2 homologs, as well as functionally similar variants and fragments that retain 20 at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring EPS8L2 (e.g., SEQ ID NOS: 239, 58-60). The term specifically includes human EPS8L2 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

The application additionally relates to the discovery that a POSH polypeptide interacts with HIP55. Accordingly, the application provides complexes comprising 25 POSH and HIP55. In one aspect, the application relates to the discovery that POSH binds directly with HIP55. This interaction was identified by Applicants in a yeast 2-hybrid assay. HIP55 is a cytoplasmic adaptor protein that has been shown to bind to the cytoplasmic tail of the CD2v protein of African swine fever virus (J Gen Virol (2004) 85:119-30). HIP55 (synonymous with mAbp1 and SH3P7) comprises 30 an SH3 domain and through its SH3 domain, associates with dynamin (J Cell Biol (2001) 153:351-66; Biochem Biophys Res Commun (2003) 301:704-10). Accordingly, in certain aspects, POSH may associate with dynamin through its

interaction with HIP55. HIP55 has also been shown to be important for receptor mediated endocytosis of the transferrin receptor (Biochem Biophys Res Commun (2003) 301:704-10).

The term HIP55 is used herein to refer to various naturally occurring HIP55 homologs, as well as functionally similar variants and fragments that retain at least 5 80%, 90%, 95%, or 99% sequence identity to a naturally occurring HIP55 (e.g., SEQ ID NOs: 390-394, 377-385). The term specifically includes human HIP55 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain embodiments, the application relates to the discovery that a POSH polypeptide interacts with CENTB1. Accordingly, the application provides 10 complexes comprising POSH and CENTB1. In one aspect, the application relates to the discovery that POSH binds directly with CENTB1. This interaction was identified by Applicants in a yeast 2-hybrid assay. CENTB1 is synonymous with ACAP1. ACAP1 is an ARF GTPase activating protein (ARF GAP). ACAP1 can 15 function as a GAP for ARF1 and ARF6 (J Biol Chem (2002) 277:7962-9).

The term CENTB1 is used herein to refer to various naturally occurring CENTB1 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring CENTB1 (e.g., SEQ ID NOs: 231-232, 37-47). The term specifically includes 20 human CENTB1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain embodiments, the application relates to the discovery that a POSH polypeptide interacts with EIF3S3. Accordingly, the application provides complexes comprising POSH and EIF3S3. In one aspect, the application relates to 25 the discovery that POSH binds directly with EIF3S3. This interaction was identified by Applicants in a yeast 2-hybrid assay. EIF3S3 is elevated in certain hepatocellular carcinomas and in prostate cancer (Hepatology (2003) 38:1242-9; Am J Pathol (2001) 159:2081-84). It has also been demonstrated that EIF3S3 is often amplified and overexpressed in breast cancer (Genes Chromosomes Cancer. (2000) 28:203-30 210).

The term EIF3S3 is used herein to refer to various naturally occurring EIF3S3 homologs, as well as functionally similar variants and fragments that retain

at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring EIF3S3 (e.g., SEQ ID NOs: 238, 55-57). The term specifically includes human EIF3S3 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain embodiments, the application relates to the discovery that a POSH polypeptide interacts with SRA1. Accordingly, the application provides complexes comprising POSH and SRA1. In one aspect, the application relates to the discovery that POSH binds directly with SRA1. This interaction was identified by Applicants in a yeast 2-hybrid assay. SRA1 is a transcriptional coactivator, steroid receptor RNA activator 1. SRA is selective for steroid hormone receptors and mediates transactivation via their amino-terminal activation function (Cell (1999) 97:17-27). The term SRA1 is used herein to refer to various naturally occurring SRA1 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring SRA1 (e.g., SEQ ID NOs: 291-294, 175-182). The term specifically includes human SRA1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

The application additionally relates to the discovery that a POSH polypeptide interacts with WASF1. Accordingly, the application provides complexes comprising POSH and WASF1. In one aspect, the application relates to the discovery that POSH binds directly with WASF1. This interaction was identified by Applicants in a yeast 2-hybrid assay. WASF1 is a member of the Wiskott-Aldrich syndrome protein (WASP) family of proteins. WASF-1 has been shown to regulate cortical actin filament reorganization in response to extracellular stimuli. WASF1 is synonymous with WAVE1 and is an actin regulatory protein. It has been shown that Ras and the adaptor protein Nck activate actin nucleation through WAVE1 (Nature (2002) 418:790-3).

The term WASF1 is used herein to refer to various naturally occurring WASF1 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring WASF1 (e.g., SEQ ID NOs: 389, 375-376). The term specifically includes human WASF1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

The application additionally relates to the discovery that a POSH polypeptide interacts with SPG20. Accordingly, the application provides complexes comprising

POSH and SPG20. In one aspect, the application relates to the discovery that POSH binds directly with SPG20. This interaction was identified by Applicants in a yeast 2-hybrid assay. SPG20 is synonymous with spartin, and mutation in the gene has been implicated in Troyer syndrome, an autosomal recessive complicated hereditary 5 spastic paraplegia. Comparative sequence analysis has shown that spartin shares similarity with molecules involved in endosomal trafficking (Nat Genet (2002) 31:347-8).

The term SPG20 is used herein to refer to various naturally occurring SPG20 homologs, as well as functionally similar variants and fragments that retain at least 10 80%, 90%, 95%, or 99% sequence identity to a naturally occurring SPG20 (e.g., SEQ ID NOS: 386-388, 367-374). The term specifically includes human SPG20 nucleic acid and amino acid sequences and the sequences presented in the Figure 36.

In further embodiments, the application relates to the discovery that a POSH polypeptide interacts with HLA-A. Accordingly, the application provides complexes comprising POSH and HLA-A. In one aspect, the application relates to the discovery that POSH binds directly with HLA-A. This interaction was identified by Applicants in a yeast 2-hybrid assay. In additional aspects, the application relates to the discovery that a POSH polypeptide interacts with HLA-B. Accordingly, the application provides complexes comprising POSH and HLA-B. In one aspect, the 15 application relates to the discovery that POSH binds directly with HLA-B. This interaction was identified by Applicants in a yeast 2-hybrid assay. HLA-A and HLA-B are MHC class I molecules. HLA-A and HLA-B molecules are downregulated in the progression of AIDS, and this downregulation is associated with the activity of HIV-1 Nef.

20 The term HLA-A is used herein to refer to various naturally occurring HLA-A homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring HLA-A (e.g., SEQ ID NOS: 253, 87-88). The term specifically includes human HLA-A nucleic acid and amino acid sequences and the sequences presented in Figure 36.

25 The term HLA-B is used herein to refer to various naturally occurring HLA-B homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring HLA-B

(e.g., SEQ ID NOs: 254, 89). The term specifically includes human HLA-B nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain aspects, the application relates to the discovery that a POSH polypeptide interacts with a ubiquitin-conjugating enzyme (E2). An exemplary E2 5 may include, but are not limited to, UBC5a, UBC5c, UBC6, and UBC13. UBC13 is often found in a heterodimer complex with a Ub conjugating enymer variant (UEV) protein, such as, for example, UEV1a. (See Hofmann and Pickart, *Noncanonical MMS2-Encoded Ubiquitin-Conjugating Enzyme Functions in Assembly of Novel Ubiquitin Chains for DNA Repair*, *Cell* 96: 645-653 (1999), McKenna et al., 2002, 10 *Energetics and Specificity of Interactions within Ub-Uev-Ubc13 Human Ubiquitin Conjugating Complexs*, *Biochemistry*. Vol. 42. pp.7922-7930, and Ulrich, 2003, *Protein-Protein Interactions within an E2-RING Finger Complex*, *The Jurnal of Biological Chemistry*, Vol. 278. No 9. pp. 7051-7058). UVE proteins share significant sequence and structural similarities with E2s, yet lack the requisite active 15 site cystine of the classical E2 protein family.

Generally, UBC5 conjugates ubiquitin to Lysine 48 in a target protein, a signal that marks the protein for degradation by the 26 S proteosome. In contrast, UBC13/UEV1a conjugates ubiquitin to Lysine 63 residue in a target protein, which is not a degradation signal. Instead, ubiquitin conjugated at Lysine 63 has been 20 implicated in diverse biological processes, including, for example, DNA damage repair, endocytosis, ribosome biogenesis, mitochondrial inheritance, and NF $\kappa$ B signaling (See Ulrich, 2003). The UBC13/UEV1a has been shown to work with two other RING-ubiquitin ligases, TRAF6 and RAD5. (See Ulrich, 2003). TRAF6-UBC13-UEV1a complex ubiquitinates TRAF6 (self-ubiquitination), thus enabling it 25 to activate a kinase cascade.

Without being bound to theory, it appears that UBC5a, UBC5c and UBC6 may work with POSH in one pathway, while UBC13/UEV1a work with POSH in another distinct pathway. This is supported by the fact that UBC5/6 marks POSH for degradation by conjugating ubiquitin at Lysine 48, whereas UBC13/UEV1a 30 marks POSH for purposes other than degradation by conjugating ubiquitin at Lysine 63. This theory is further supported by the fact that UBC5a, UBC5c and UBC6 share high sequence similarities.

Accordingly, in certain aspects, the present application relates to an isolated, purified or recombinant complex comprising a POSH polypeptide and a UBC13. In certain aspects, the present application relates to an isolated, purified or recombinant complex comprising: a polypeptide comprising a domain that is at least 90% identical to a POSH RING domain, and a POSH-AP comprising an E2. An exemplary POSH associated protein E2 include, for example, is UBC13. UBC13 may be in a heterodimer complex with a Ub conjugating enzyme variant (UEV) protein, such as, for example, UEV1a.

The term "UBC13" and is used herein to refer to full-length UBC13, any splice variants thereof, various naturally occurring UBC13 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring UBC13 (e.g., SEQ ID NOs: 313, 208-210). The term specifically includes UBC13 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain embodiments, the application relates to the interaction between an ARF5 polypeptide and a POSH polypeptide. ARF5 is a member of the ARF gene family. The ARF proteins stimulate the in vitro ADP-ribosyltransferase activity of cholera toxin. ARF proteins play a role in vesicular trafficking in vivo. ARFs are members of the Ras GTPase superfamily. ARFs activate specific PLDs. Mammalian ARFs are divided into three classes based on size, amino acid sequence, gene structure, and phylogenetic analysis. ARF1 is in class I, and ARF5 is in class II.

In certain embodiments, the application relates to the interaction between an ARF1 polypeptide and a POSH polypeptide. ARF1 is a small G protein involved in vesicular trafficking. The assembly/disassembly cycle of the coat protein I (COPI) on Golgi membranes is coupled to the GTP/GDP cycle of ARF1 (Nature (2003) 426:563-6). ARF1 has been implicated in mitotic Golgi disassembly, chromosome segregation, and cytokinesis (Proc Natl Acad Sci (2003) 100:13314-9). ARF1 has been shown to bind to the 5-HT2A receptor, a G protein coupled receptor (GPCR) (Mol Pharmacol (2003) 64:1239-50).

The term ARF-1 is used herein to refer to various naturally occurring ARF-1 homologs, as well as functionally similar variants and fragments that retain at least

80%, 90%, 95%, or 99% sequence identity to a naturally occurring ARF-1 (e.g. SEQ ID NOS: 223, 325-339). The term specifically includes human ARF-1 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

The term ARF-5 is used herein to refer to various naturally occurring ARF-5 homologs, as well as functionally similar variants and fragments that retain at least 5 80%, 90%, 95%, or 99% sequence identity to a naturally occurring ARF-5 (e.g., SEQ ID NOS: 224, 340-344). The term specifically includes human ARF-5 nucleic acid and amino acid sequences and the sequences presented in Figure 36.

In certain embodiments, the application relates to the inhibition of viral maturation by modulation of an activity associated with a dynamin II polypeptide. 10 Dynamin II is a large GTP-binding protein that is involved in endocytosis and in vesicle formation at the trans-Golgi network. Dynamin II contains a pleckstrin homology domain (PHD) and a proline-rich domain (PRD). Dynamin II plays an important role in vesicle formation at the plasma membrane, trans-Golgi network, 15 and various other intracellular organelles. Accordingly, disrupting the activity of a dynamin II polypeptide or the interaction between a POSH polypeptide and a dynamin II polypeptide (e.g., by reducing POSH protein levels or alternatively, reducing dynamin II protein levels, through RNAi) may disrupt the activity of dynamin II in the secretory pathway and prevent the secretion of viral proteins, such 20 as, for example, HBV proteins. Dynamin II participates in the transport and secretion of HBV proteins (Abdulkarim, AS et al (2003) J. Hepat. 38:76-83). Accordingly, in certain embodiments, inhibition of POSH adversely effects the 25 transport and release of HBV proteins.

In certain embodiments, the application relates to the inhibition of dynamin activity, in particular the inhibition of the activity of dynamin II, a member of the 25 dynamin family of proteins. In certain embodiments, the application relates to inhibition of dynamin II activity, which inhibition disrupts the transport and secretion of HBV proteins. The term dynamin II is used herein to refer to full-length, human dynamin II as well as various naturally occurring dynamin II 30 homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring dynamin II (e.g.,

public gi number: 1196422, public gi number: 1706539, public gi number: 1196423, and public gi number: 1363934).

In certain embodiments, the application relates to the inhibition of viral maturation by modulation of an activity associated with a Vpu polypeptide. Vpu is an HIV-1 encoded ion channel, which, among other tasks in the HIV-1 life cycle, is necessary for efficient virus budding (Schubert, U et al (1995) J. Virol. 69:7699-7711). Vpu may function at the trans Golgi network (TGN). Vpu expresses an acidic amino acid sorting motif that is required for TGN localization through a retroviral process mediated by the POSH-AP, PACS-1 (Wan, L et al (1998) Cell 94:205-216). Moreover, the phenotype conferred by human POSH knockdown is similar to that observed in cells expressing HIV-1 lacking Vpu where viruses also accumulate in intracellular membranes (Klimkait, T et al (1990) J. Virol. 64:621-629).

Vpu regulates virus release from a post-endoplasmic reticulum compartment, such as possibly the TGN, by an ion channel activity mediated by its transmembrane anchor. Vpu also induces the selective down regulation of host cell receptor proteins such as CD4 and major histocompatibility complex class I molecules, in a process involving its cytoplasmic tail. Furthermore, Vpu-mediated degradation of CD4 is dependent on an intact ubiquitin-conjugating system. (See Schubert, U et al (1998) J. Virol. 72:2280-8). In certain embodiments of the present invention, Vpu-mediated degradation of a protein such as CD4 may involve a ubiquitin-conjugating system that includes a POSH polypeptide or a POSH-AP, such as, for example, Cbl-b.

Vpu nucleic acid and the corresponding amino acid sequence encoded thereby are exemplified by the Vpu discussed in Strelbel, K et al (1988) 241:1221-1223. The term Vpu is used herein to refer as well to Vpu of other HIV-1 isolates, such as the Vpu disclosed in GenBank, accession number U51190, and the Vpu disclosed in GenBank, accession number U52953. The term Vpu is used herein to refer as well to various naturally occurring Vpu homologs, as well as functionally similar variants and fragments that retain at least 80%, 90%, 95%, or 99% sequence identity to a naturally occurring Vpu.

4. Methods and Compositions for Treating POSH-associated Diseases  
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In certain aspects, the application provides methods and compositions for treatment of POSH-associated diseases (disorders), including cancer and viral disorders, as well as disorders associated with unwanted apoptosis, including, for example a variety of neurodegenerative disorders, such as Alzheimer's disease.

5 In certain embodiments, the application relates to viral disorders (e.g., viral infections), and particularly disorders caused by retroviruses, RNA viruses and/or envelope viruses. In view of the teachings herein, one of skill in the art will understand that the methods and compositions of the application are applicable to a wide range of viruses such as, for example, retrovirus, RNA viruses, and  
10 envelope viruses. In a preferred embodiment, the present application is applicable to retrovirus. In a more preferred embodiment, the present application is further applicable to retroviruses (retroviridae). In another more preferred embodiment, the present application is applicable to lentivirus, including primate lentivirus group. In a most preferred embodiment, the present application is applicable to Human  
15 Immunodeficiency virus (HIV), Human Immunodeficiency virus type-1 (HIV-1), Hepatitis B Virus (HBV) and Human T-cell Leukemia Virus (HTLV).

While not intended to be limiting, relevant retroviruses include: C-type retrovirus which causes lymphosarcoma in Northern Pike, the C-type retrovirus which infects mink, the caprine lentivirus which infects sheep, the Equine Infectious  
20 Anemia Virus (EIAV), the C-type retrovirus which infects pigs, the Avian Leukosis Sarcoma Virus (ALSV), the Feline Leukemia Virus (FeLV), the Feline Aids Virus, the Bovine Leukemia Virus (BLV), Moloney Murine Leukemia Virus (MMuLV), the Simian Leukemia Virus (SLV), the Simian Immuno-deficiency Virus (SIV), the Human T-cell Leukemia Virus type-I (HTLV-I), the Human T-cell Leukemia Virus  
25 type-II (HTLV-II), Human Immunodeficiency virus type-2 (HIV-2) and Human Immunodeficiency virus type-1 (HIV-1).

The method and compositions of the present application are further applicable to RNA viruses, including ssRNA negative-strand viruses and ssRNA positive-strand viruses. The ssRNA positive-strand viruses include Hepatitis C  
30 Virus (HCV). In a preferred embodiment, the present application is applicable to mononegavirales, including filoviruses. Filoviruses further include Ebola viruses

and Marburg viruses. In another preferred embodiment, the present invention is applicable to flaviviruses, including West Nile Virus (WNV).

Other RNA viruses include picornaviruses such as enterovirus, poliovirus, coxsackievirus and hepatitis A virus, the caliciviruses, including Norwalk-like 5 viruses, the rhabdoviruses, including rabies virus, the togaviruses including alphaviruses, Semliki Forest virus, denguevirus, yellow fever virus and rubella virus, the orthomyxoviruses, including Type A, B, and C influenza viruses, the bunyaviruses, including the Rift Valley fever virus and the hantavirus, the filoviruses such as Ebola virus and Marburg virus, and the paramyxoviruses, 10 including mumps virus and measles virus. Additional viruses that may be treated include herpes viruses.

The methods and compositions of the present application are further applicable to hepatotrophic viruses, including HAV, HBV, HCV, HDV, and HEV. In certain aspects, the application relates to a method of inhibiting a hepatotrophic 15 virus, comprising administering a POSH inhibitor to a subject in need thereof. In further aspects, the application relates to a method of treating a viral hepatitis infection, comprising administering a POSH inhibitor to a subject in need thereof. A viral hepatitis infection may be caused by a hepatotrophic virus, such as HAV, HBV, HCV, HDV, or HEV. In certain embodiments, the application relates to a 20 method of treating an HBV infection by administering a POSH inhibitor to a subject in need thereof.

In other embodiments, the application relates to methods of treating or preventing cancer diseases. The terms "cancer," "tumor," and "neoplasia" are used interchangeably herein. As used herein, a cancer (tumor or neoplasia) is 25 characterized by one or more of the following properties: cell growth is not regulated by the normal biochemical and physical influences in the environment; anaplasia (e.g., lack of normal coordinated cell differentiation); and in some instances, metastasis. Cancer diseases include, for example, anal carcinoma, bladder carcinoma, breast carcinoma, cervix carcinoma, chronic lymphocytic leukemia, 30 chronic myelogenous leukemia, endometrial carcinoma, hairy cell leukemia, head and neck carcinoma, lung (small cell) carcinoma, multiple myeloma, non-Hodgkin's lymphoma, follicular lymphoma, ovarian carcinoma, brain tumors, colorectal

carcinoma, hepatocellular carcinoma, Kaposi's sarcoma, lung (non-small cell carcinoma), melanoma, pancreatic carcinoma, prostate carcinoma, renal cell carcinoma, and soft tissue sarcoma. Additional cancer disorders can be found in, for example, Isselbacher et al. (1994) Harrison's Principles of Internal Medicine 1814-

5 1877, herein incorporated by reference.

In a specific embodiment, anticancer therapeutics of the application are used in treating a POSH-associated cancer. As described herein, POSH-associated cancers include, but are not limited to, the thyroid carcinoma, liver cancer (hepatocellular cancer), lung cancer, cervical cancer, ovarian cancer, renal cell carcinoma, lymphoma, osteosacoma, liposarcoma, leukemia, breast carcinoma, and breast adeno-carcinoma.

10 Preferred antiviral and anticancer therapeutics of the application can function by disrupting the biological activity of a POSH polypeptide or POSH complex in viral maturation. Certain therapeutics of the application function by disrupting the 15 activity of a POSH-AP (e.g., HERPUD1) in viral maturation. Certain therapeutics of the application function by disrupting the activity of POSH by inhibiting the ubiquitin ligase activity of a POSH polypeptide. In certain embodiments of the application, a therapeutic of the application inhibits the ubiquitination of a POSH-AP, such as for example the ubiquitination of HERPUD1.

20 In other embodiments, the application relates to methods of treating or preventing neurological disorders. In one aspect, the invention provides methods and compositions for the identification of compositions that interfere with the function of a POSH or a POSH-AP, which function may relate to aberrant protein processing associated with a neurodegenerative disorder, such as for example, the 25 processing of amyloid beta precursor protein associated with Alzheimer's disease. Neurological disorders include disorders associated with increased levels of amyloid β production, such as for example, Alzheimer's disease. Neurological disorders also include Parkinson's disease, Huntington's disease, schizophrenia, Niemann-Pick's disease, and prion-associated diseases

30 Exemplary therapeutics of the application include nucleic acid therapies such as, for example, RNAi constructs (small inhibitory RNAs), antisense

oligonucleotides, ribozyme, and DNA enzymes. Other therapeutics include polypeptides, peptidomimetics, antibodies and small molecules.

Antisense therapies of the application include methods of introducing antisense nucleic acids to disrupt the expression of POSH polypeptides or proteins  
5 that are necessary for POSH function.

RNAi therapies include methods of introducing RNAi constructs to downregulate the expression of POSH polypeptides or POSH-APs (e.g., HERPUD1). In certain embodiments, RNAi therapeutics are delivered to the liver  
10 (e.g., to hepatocytes). Exemplary RNAi therapeutics include any one of SEQ ID NOs: 15, 16, 18, 19, 21, 22, 24 and 25.

Therapeutic polypeptides may be generated by designing polypeptides to mimic certain protein domains important in the formation of POSH: POSH-AP complexes, such as, for example, SH3 or RING domains. For example, a polypeptide comprising a POSH SH3 domain such as, for example, the SH3 domain  
15 as set forth in SEQ ID NO: 30 will compete for binding to a POSH SH3 domain and will therefore act to disrupt binding of a partner protein. In one embodiment, a binding partner may be a Gag polypeptide. In another embodiment, a binding partner may be Rac. In a further embodiment, a polypeptide that resembles an L domain may disrupt recruitment of Gag to the POSH complex.

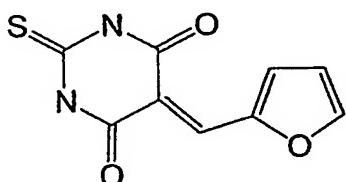
In view of the specification, methods for generating antibodies directed to epitopes of POSH and POSH-APs are known in the art. Antibodies may be introduced into cells by a variety of methods. One exemplary method comprises generating a nucleic acid encoding a single chain antibody that is capable of disrupting a POSH:POSH-AP complex. Such a nucleic acid may be conjugated to  
20 antibody that binds to receptors on the surface of target cells. It is contemplated that in certain embodiments, the antibody may target viral proteins that are present on the surface of infected cells, and in this way deliver the nucleic acid only to infected cells. Once bound to the target cell surface, the antibody is taken up by endocytosis, and the conjugated nucleic acid is transcribed and translated to produce a single  
25 chain antibody that interacts with and disrupts the targeted POSH:POSH-AP complex. Nucleic acids expressing the desired single chain antibody may also be  
30

introduced into cells using a variety of more conventional techniques, such as viral transfection (e.g., using an adenoviral system) or liposome-mediated transfection.

Small molecules of the application may be identified for their ability to modulate the formation of POSH:POSH-AP complexes.

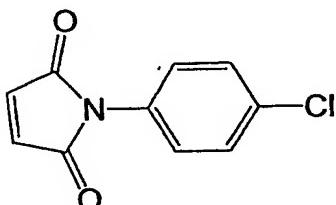
5 Certain embodiments of the disclosure relate to use of a small molecule as an inhibitor of POSH. Examples of such small molecules include the following compounds:

Compound CAS 27430-18-8:



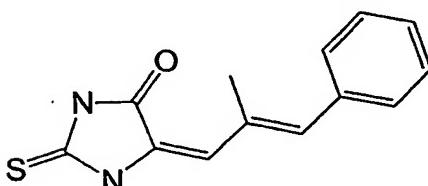
10

Compound CAS 1631-29-4:

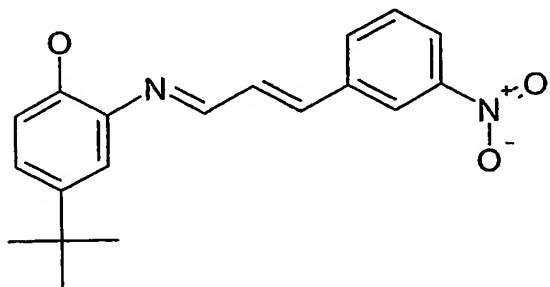


15

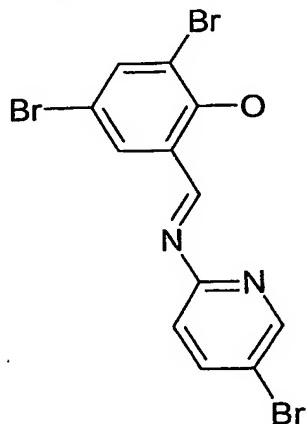
Compound CAS 503065-65-4:



Compound CAS 414908-08:

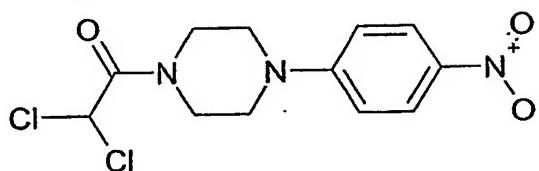


Compound CAS 415703-60-5:



5

Compound CAS 77367-94-3:



10

In certain embodiments, compounds useful in the instant compositions and methods include heteroarylmethylene-dihydro-2,4,6-pyrimidinetrones and their thione analogs. Preferred heteroaryl moieties include 5-membered rings such as thienyl, furyl, pyrrolyl, oxazolyl, thiazolyl, and imidazolyl moieties.

15

In certain embodiments, compounds useful in the instant compositions and methods include N-arylmaleimides, especially N-phenylmaleimides, in which the phenyl group may be substituted or unsubstituted.

In certain embodiments, compounds useful in the instant compositions and methods include arylallylidene-2,4-imidazolidinediones and their thione analogs.

Preferred aryl groups are phenyl groups, and both the aryl and allylidene portions of the molecule may be substituted or unsubstituted.

In certain embodiments, compounds useful in the instant compositions and methods include substituted distyryl compounds and aza analogs thereof such as 5 substituted 1,4-diphenylazabutadiene compounds.

In certain other embodiments, compounds useful in the instant compositions and methods include substituted styrenes and aza analogs thereof, such as 1,2-diphenylazaethylenes and 1-phenyl-2-pyridyl-azaethylenes.

10 In yet other embodiments, compounds useful in the instant compositions and methods include N-aryl-N'-acylpiperazines. In such compounds, the aryl ring, the acyl substituent, and/or the piperazine ring may be substituted or unsubstituted.

In additional embodiments, compounds useful in the instant compositions and methods include aryl esters of (2-oxo-benzoxazol-3-yl)-acetic acid, and analogs thereof in which one or more oxygen atoms are replaced by sulfur atoms.

15 In certain embodiments, the present application contemplates use of known PKA modulators (e.g., inhibitors or activators) in the methods of inhibiting viral infection and in the methods of treating or preventing cancer. Such PKA modulators include any compound, peptide, nucleotide derivative, nucleoside derivative, polysaccharide, sugar or other substance that can inhibit the activity of protein 20 kinase A. Many PKA inhibitors are available and may be used. For example, many examples of PKA inhibitors including chemical structures, methods for administration and pharmacological effects are listed at the Calbiochem website at calbiochem.com. In general, inhibitors that also significantly inhibit protein kinase C activity are avoided.

25 In some embodiments, the PKA inhibitor is a nucleotide or nucleoside derivative. Specific examples of nucleoside or nucleotide derivatives that act as PKA inhibitors and that can be utilized in the disclosure include adenosine 3',5' cyclic monophosphorothioate. The H-89 inhibitor is a potent PKA inhibitor that can be used in the disclosure. The chemical name for the H-89 inhibitor is N-[2- 30 ((Pbromocinnamyl) amino)ethyl] isoquinolinesulfonamide. The KT5720 inhibitor from Calbiochem can also be used in the disclosure. Other PKA inhibitors which are available at from Calbiochem and can be used in the disclosure include ellagic acid

(also named 4,4',5,5',6,6'-hexahydroxydiphenic acid 2,6,2',6'-ditactone), piceatannol, 1-(5-Isoquinolinesulfonyl) methylpiperazine (H-7), N-[2-(methylamino)ethyl] isoquinolinesulfonamide (H-8), N-(2-aminoethyl) isoquinolinesulfonamide (H-9), and (5-isooquinolinesulfonyl)piperazine, 2HCl (H-100).

5       The PKA inhibitor can also be a peptide inhibitor (PKI). Such a peptide inhibitor can be any peptide that is recognized and bound by PKA but that PKA cannot phosphorylate. An example of a peptide inhibitor is a peptide with a "consensus sequence" for PKA recognition but with alanine in place of serine, for example, a peptide with the following sequence: Xaa-Arg-Arg-Xaa-Ala-Xaa,  
10      wherein Xaa is any amino acid, which specifically binds to the pseudoregion of the regulatory domain of PKA. Myristoylated PKA inhibitor amide (14-22, Cell-Permeable) having the sequence Myr-N-Gly-Arg-Thr-Gly-Arg-Arg-Asn-Ala-Ile-NH<sub>2</sub> is another example of a peptide inhibitor that can be utilized in the disclosure. A variety of other PKI peptides can be used as an inhibitor of protein kinase A in the practice of the disclosure. For example, several PKI peptides can be found in the  
15      NCBI protein database. See website at ncbi.nlm.nih.gov/Genbank/GenbankOverview. One example of a human PKI peptide can be found at Genbank Accession No. P04541 (gi: 417194). Another example of a human PKI peptide is at Genbank Accession No. NP 008997 (gi: 5902020). Another PKI that  
20      can be used as an inhibitor has the following sequence: Ile-Ala-Ser-Gly-Arg-Thr-Gly-Arg-Arg-Asn-Ala-Ile-His-Asp-11e-Leu-Val-SerSer-Ala. See published PCT application WO 03/080649.

Further examples of protein kinase A inhibitors are provided in the following references: Muniz et al., Proceedings of the National Academy of Sciences USA  
25      1997 Dec 23; 94(26) 14461-66; Baude et al., Journal of Biological Chemistry Vol.  
269 issue 27 18128-18133 (Jul. 1994); Scott et al.

Applicants found that POSH is phosphorylated by PKA and phosphorylation of POSH by PKA can inhibit POSH function, for example dissociating POSH from POSH interacting proteins (e.g., Rac). Therefore, in certain embodiments, the present  
30      disclosure also contemplates use of PKA activators in treating or preventing a POSH-associated disease (e.g., viral infection or cancer). Exemplary PKA activators include, but are not limited to, forskolin, 8-Br-cAMP, and rolipram.

In additional embodiments of the application, compounds useful in the present application include phosphatase inhibitors. Phosphatase inhibitors useful in the subject application include sodium phosphate, sodium vanadate, and okadaic acid. In certain embodiments, the present application contemplates use of known 5 phosphatase inhibitors in the methods of inhibiting viral infection, in the methods of treating or preventing cancer, and in the methods of inhibiting the progression of a neurodegenerative disorder. Phosphatase inhibitors may be useful in inhibiting the activity of a POSH-AP, such as for example, PTPN12.

For POSH-APs that are GTPases, inhibitors such as GTPgamma35S would 10 be effective at inhibiting the GTPase activity of the POSH-AP. For example, inhibition of ARF1 or ARF5 could be accomplished with the use of a GTPase inhibitor such as GTPgamma35S, a non-hydrolyzable form of GTP.

The generation of nucleic acid based therapeutic agents directed to POSH and POSH-APs is described below.

15 Methods for identifying and evaluating further modulators of POSH and POSH-APs are also provided below.

5. RNA Interference, Ribozymes, Antisense and Related Constructs

In certain aspects, the application relates to RNAi, ribozyme, antisense and 20 other nucleic acid-related methods and compositions for manipulating (typically decreasing) a POSH activity. Exemplary RNAi and ribozyme molecules may comprise a sequence as shown in any of SEQ ID Nos: 15, 16, 18, 19, 21, 22, 24 and 25.

25 In certain aspects, the application relates to RNAi, ribozyme, antisense and other nucleic acid-related methods and compositions for manipulating (typically decreasing) a POSH-AP activity. Specific instances of nucleic acids that may be used to design nucleic acids for RNAi, ribozyme, antisense are provided in Figure 36. Additionally, nucleic acids of POSH-APs listed in Table 8 may be used to design nucleic acids for RNAi, ribozyme, antisense.

30 Certain embodiments of the application make use of materials and methods for effecting knockdown of one or more POSH or POSH-AP genes by means of RNA interference (RNAi). RNAi is a process of sequence-specific post-

transcriptional gene repression which can occur in eukaryotic cells. In general, this process involves degradation of an mRNA of a particular sequence induced by double-stranded RNA (dsRNA) that is homologous to that sequence. For example, the expression of a long dsRNA corresponding to the sequence of a particular single-stranded mRNA (ss mRNA) will inhibit that message, thereby "interfering" with expression of the corresponding gene. Accordingly, any selected gene may be repressed by introducing a dsRNA which corresponds to all or a substantial part of the mRNA for that gene. It appears that when a long dsRNA is expressed, it is initially processed by a ribonuclease III into shorter dsRNA oligonucleotides of as few as 21 to 22 base pairs in length. Furthermore, Accordingly, RNAi may be effected by introduction or expression of relatively short homologous dsRNAs. Indeed the use of relatively short homologous dsRNAs may have certain advantages as discussed below.

Mammalian cells have at least two pathways that are affected by double-stranded RNA (dsRNA). In the RNAi (sequence-specific) pathway, the initiating dsRNA is first broken into short interfering (si) RNAs, as described above. The siRNAs have sense and antisense strands of about 21 nucleotides that form approximately 19 nucleotide si RNAs with overhangs of two nucleotides at each 3' end. Short interfering RNAs are thought to provide the sequence information that allows a specific messenger RNA to be targeted for degradation. In contrast, the nonspecific pathway is triggered by dsRNA of any sequence, as long as it is at least about 30 base pairs in length. The nonspecific effects occur because dsRNA activates two enzymes: PKR, which in its active form phosphorylates the translation initiation factor eIF2 to shut down all protein synthesis, and 2', 5' oligoadenylate synthetase (2', 5'-AS), which synthesizes a molecule that activates RNase L, a nonspecific enzyme that targets all mRNAs. The nonspecific pathway may represent a host response to stress or viral infection, and, in general, the effects of the nonspecific pathway are preferably minimized under preferred methods of the present application. Significantly, longer dsRNAs appear to be required to induce the nonspecific pathway and, accordingly, dsRNAs shorter than about 30 bases pairs are preferred to effect gene repression by RNAi (see Hunter et al. (1975) J Biol

Chem 250: 409-17; Manche et al. (1992) Mol Cell Biol 12: 5239-48; Minks et al. (1979) J Biol Chem 254: 10180-3; and Elbashir et al. (2001) Nature 411: 494-8).

RNAi has been shown to be effective in reducing or eliminating the expression of genes in a number of different organisms including *Caenorhabditis elegans* (see e.g., Fire et al. (1998) Nature 391: 806-11), mouse eggs and embryos (Wianny et al. (2000) Nature Cell Biol 2: 70-5; Svoboda et al. (2000) Development 127: 4147-56), and cultured RAT-1 fibroblasts (Bahramina et al. (1999) Mol Cell Biol 19: 274-83), and appears to be an anciently evolved pathway available in eukaryotic plants and animals (Sharp (2001) Genes Dev. 15: 485-90). RNAi has proven to be an effective means of decreasing gene expression in a variety of cell types including HeLa cells, NIH/3T3 cells, COS cells, 293 cells and BHK-21 cells, and typically decreases expression of a gene to lower levels than that achieved using antisense techniques and, indeed, frequently eliminates expression entirely (see Bass (2001) Nature 411: 428-9). In mammalian cells, siRNAs are effective at concentrations that are several orders of magnitude below the concentrations typically used in antisense experiments (Elbashir et al. (2001) Nature 411: 494-8).

The double stranded oligonucleotides used to effect RNAi are preferably less than 30 base pairs in length and, more preferably, comprise about 25, 24, 23, 22, 21, 20, 19, 18 or 17 base pairs of ribonucleic acid. Optionally the dsRNA oligonucleotides of the application may include 3' overhang ends. Exemplary 2-nucleotide 3' overhangs may be composed of ribonucleotide residues of any type and may even be composed of 2'-deoxythymidine residues, which lowers the cost of RNA synthesis and may enhance nuclease resistance of siRNAs in the cell culture medium and within transfected cells (see Elbashir et al. (2001) Nature 411: 494-8). Longer dsRNAs of 50, 75, 100 or even 500 base pairs or more may also be utilized in certain embodiments of the application. Exemplary concentrations of dsRNAs for effecting RNAi are about 0.05 nM, 0.1 nM, 0.5 nM, 1.0 nM, 1.5 nM, 25 nM or 100 nM, although other concentrations may be utilized depending upon the nature of the cells treated, the gene target and other factors readily discernable the skilled artisan. Exemplary dsRNAs may be synthesized chemically or produced in vitro or in vivo using appropriate expression vectors. Exemplary synthetic RNAs include 21 nucleotide RNAs chemically synthesized using methods known in the art (e.g.,

Expedite RNA phosphoramidites and thymidine phosphoramidite (Proligo, Germany). Synthetic oligonucleotides are preferably deprotected and gel-purified using methods known in the art (see e.g., Elbashir et al. (2001) Genes Dev. 15: 188-200). Longer RNAs may be transcribed from promoters, such as T7 RNA polymerase promoters, known in the art. A single RNA target, placed in both possible orientations downstream of an in vitro promoter, will transcribe both strands of the target to create a dsRNA oligonucleotide of the desired target sequence. Any of the above RNA species will be designed to include a portion of nucleic acid sequence represented in a POSH or POSH-AP nucleic acid, such as, for example, a nucleic acid that hybridizes, under stringent and/or physiological conditions, to any of SEQ ID Nos: 1, 3, 4, 6, 8 and 10 and complements thereof or any of the POSH-AP sequences presented in Figure 36.

The specific sequence utilized in design of the oligonucleotides may be any contiguous sequence of nucleotides contained within the expressed gene message of the target. Programs and algorithms, known in the art, may be used to select appropriate target sequences. In addition, optimal sequences may be selected utilizing programs designed to predict the secondary structure of a specified single stranded nucleic acid sequence and allowing selection of those sequences likely to occur in exposed single stranded regions of a folded mRNA. Methods and compositions for designing appropriate oligonucleotides may be found, for example, in U.S. Patent Nos. 6,251,588, the contents of which are incorporated herein by reference. Messenger RNA (mRNA) is generally thought of as a linear molecule which contains the information for directing protein synthesis within the sequence of ribonucleotides, however studies have revealed a number of secondary and tertiary structures that exist in most mRNAs. Secondary structure elements in RNA are formed largely by Watson-Crick type interactions between different regions of the same RNA molecule. Important secondary structural elements include intramolecular double stranded regions, hairpin loops, bulges in duplex RNA and internal loops. Tertiary structural elements are formed when secondary structural elements come in contact with each other or with single stranded regions to produce a more complex three dimensional structure. A number of researchers have measured the binding energies of a large number of RNA duplex structures and have

derived a set of rules which can be used to predict the secondary structure of RNA (see e.g., Jaeger et al. (1989) Proc. Natl. Acad. Sci. USA 86:7706 (1989); and Turner et al. (1988) Annu. Rev. Biophys. Biophys. Chem. 17:167). The rules are useful in identification of RNA structural elements and, in particular, for identifying 5 single stranded RNA regions which may represent preferred segments of the mRNA to target for silencing RNAi, ribozyme or antisense technologies. Accordingly, preferred segments of the mRNA target can be identified for design of the RNAi mediating dsRNA oligonucleotides as well as for design of appropriate ribozyme and hammerheadribozyme compositions of the application.

10 The dsRNA oligonucleotides may be introduced into the cell by transfection with an heterologous target gene using carrier compositions such as liposomes, which are known in the art- e.g., Lipofectamine 2000 (Life Technologies) as described by the manufacturer for adherent cell lines. Transfection of dsRNA oligonucleotides for targeting endogenous genes may be carried out using 15 Oligofectamine (Life Technologies). Transfection efficiency may be checked using fluorescence microscopy for mammalian cell lines after co-transfection of hGFP-encoding pAD3 (Kehlenback et al. (1998) J Cell Biol 141: 863-74). The effectiveness of the RNAi may be assessed by any of a number of assays following introduction of the dsRNAs. These include Western blot analysis using antibodies 20 which recognize the POSH or POSH-AP gene product following sufficient time for turnover of the endogenous pool after new protein synthesis is repressed, reverse transcriptase polymerase chain reaction and Northern blot analysis to determine the level of existing POSH or POSH-AP target mRNA.

Further compositions, methods and applications of RNAi technology are 25 provided in U.S. Patent Application Nos. 6,278,039, 5,723,750 and 5,244,805, which are incorporated herein by reference.

Ribozyme molecules designed to catalytically cleave POSH or POSH-AP mRNA transcripts can also be used to prevent translation of suject POSH or POSH-AP mRNAs and/or expression of POSH or POSH-APs (see, e.g., PCT International 30 Publication WO90/11364, published October 4, 1990; Sarver et al. (1990) Science 247:1222-1225 and U.S. Patent No. 5,093,246). Ribozymes are enzymatic RNA molecules capable of catalyzing the specific cleavage of RNA. (For a review, see

Rossi (1994) Current Biology 4: 469-471). The mechanism of ribozyme action involves sequence specific hybridization of the ribozyme molecule to complementary target RNA, followed by an endonucleolytic cleavage event. The composition of ribozyme molecules preferably includes one or more sequences 5 complementary to a POSH or POSH-AP mRNA, and the well known catalytic sequence responsible for mRNA cleavage or a functionally equivalent sequence (see, e.g., U.S. Pat. No. 5,093,246, which is incorporated herein by reference in its entirety).

While ribozymes that cleave mRNA at site specific recognition sequences 10 can be used to destroy target mRNAs, the use of hammerhead ribozymes is preferred. Hammerhead ribozymes cleave mRNAs at locations dictated by flanking regions that form complementary base pairs with the target mRNA. Preferably, the target mRNA has the following sequence of two bases: 5'-UG-3'. The construction and production of hammerhead ribozymes is well known in the art and is described 15 more fully in Haseloff and Gerlach ((1988) Nature 334:585-591; and see PCT Appln. No. WO89/05852, the contents of which are incorporated herein by reference). Hammerhead ribozyme sequences can be embedded in a stable RNA such as a transfer RNA (tRNA) to increase cleavage efficiency in vivo (Perriman et al. (1995) Proc. Natl. Acad. Sci. USA, 92: 6175-79; de Feyter, and Gaudron, 20 Methods in Molecular Biology, Vol. 74, Chapter 43, "Expressing Ribozymes in Plants", Edited by Turner, P. C., Humana Press Inc., Totowa, N.J.). In particular, RNA polymerase III-mediated expression of tRNA fusion ribozymes are well known in the art ( see Kawasaki et al. (1998) Nature 393: 284-9; Kuwabara et al. 25 (1998) Nature Biotechnol. 16: 961-5; and Kuwabara et al. (1998) Mol. Cell 2: 617-27; Koseki et al. (1999) J Virol 73: 1868-77; Kuwabara et al. (1999) Proc Natl Acad Sci USA 96: 1886-91; Tanabe et al. (2000) Nature 406: 473-4). There are typically 30 a number of potential hammerhead ribozyme cleavage sites within a given target cDNA sequence. Preferably the ribozyme is engineered so that the cleavage recognition site is located near the 5' end of the target mRNA- to increase efficiency and minimize the intracellular accumulation of non-functional mRNA transcripts. Furthermore, the use of any cleavage recognition site located in the target sequence encoding different portions of the C-terminal amino acid domains of, for example,

long and short forms of target would allow the selective targeting of one or the other form of the target, and thus, have a selective effect on one form of the target gene product.

Gene targeting ribozymes necessarily contain a hybridizing region 5 complementary to two regions, each of at least 5 and preferably each 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 or 20 contiguous nucleotides in length of a POSH or POSH-AP mRNA, such as an mRNA of a sequence represented in any of SEQ ID Nos: 1, 3, 4, 6, 8 or 10 or a POSH-AP presented in Figure 36. In addition, 10 ribozymes possess highly specific endoribonuclease activity, which autocatalytically cleaves the target sense mRNA. The present application extends to ribozymes which hybridize to a sense mRNA encoding a POSH gene such as a therapeutic drug target candidate gene, thereby hybridising to the sense mRNA and cleaving it, such that it is no longer capable of being translated to synthesize a functional polypeptide product.

15 The ribozymes of the present application also include RNA endoribonucleases (hereinafter "Cech-type ribozymes") such as the one which occurs naturally in *Tetrahymena thermophila* (known as the IVS, or L-19 IVS RNA) and which has been extensively described by Thomas Cech and collaborators (Zaug, et al. (1984) *Science* 224:574-578; Zaug, et al. (1986) *Science* 231:470-475; Zaug, 20 et al. (1986) *Nature* 324:429-433; published International patent application No. WO88/04300 by University Patents Inc.; Been, et al. (1986) *Cell* 47:207-216). The Cech-type ribozymes have an eight base pair active site which hybridizes to a target RNA sequence whereafter cleavage of the target RNA takes place. The application encompasses those Cech-type ribozymes which target eight base-pair active site 25 sequences that are present in a target gene or nucleic acid sequence.

Ribozymes can be composed of modified oligonucleotides (e.g., for improved stability, targeting, etc.) and should be delivered to cells which express the target gene *in vivo*. A preferred method of delivery involves using a DNA construct 30 "encoding" the ribozyme under the control of a strong constitutive pol III or pol II promoter, so that transfected cells will produce sufficient quantities of the ribozyme to destroy endogenous target messages and inhibit translation. Because ribozymes,

unlike antisense molecules, are catalytic, a lower intracellular concentration is required for efficiency.

In certain embodiments, a ribozyme may be designed by first identifying a sequence portion sufficient to cause effective knockdown by RNAi. The same sequence portion may then be incorporated into a ribozyme. In this aspect of the application, the gene-targeting portions of the ribozyme or RNAi are substantially the same sequence of at least 5 and preferably 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 or 20 or more contiguous nucleotides of a POSH nucleic acid, such as a nucleic acid of any of SEQ ID Nos: 1, 3, 4, 6, 8, or 10 or POSH-AP nucleic acid, as presented in Figure 36. In a long target RNA chain, significant numbers of target sites are not accessible to the ribozyme because they are hidden within secondary or tertiary structures (Birikh et al. (1997) Eur J Biochem 245: 1-16). To overcome the problem of target RNA accessibility, computer generated predictions of secondary structure are typically used to identify targets that are most likely to be single-stranded or have an "open" configuration (see Jaeger et al. (1989) Methods Enzymol 183: 281-306). Other approaches utilize a systematic approach to predicting secondary structure which involves assessing a huge number of candidate hybridizing oligonucleotides molecules (see Milner et al. (1997) Nat Biotechnol 15: 537-41; and Patzel and Sczakiel (1998) Nat Biotechnol 16: 64-8). Additionally, U.S. Patent No. 6,251,588, the contents of which are hereby incorporated herein, describes methods for evaluating oligonucleotide probe sequences so as to predict the potential for hybridization to a target nucleic acid sequence. The method of the application provides for the use of such methods to select preferred segments of a target mRNA sequence that are predicted to be single-stranded and, further, for the opportunistic utilization of the same or substantially identical target mRNA sequence, preferably comprising about 10-20 consecutive nucleotides of the target mRNA, in the design of both the RNAi oligonucleotides and ribozymes of the application.

A further aspect of the application relates to the use of the isolated "antisense" nucleic acids to inhibit expression, e.g., by inhibiting transcription and/or translation of a POSH or POSH-AP nucleic acid. The antisense nucleic acids may bind to the potential drug target by conventional base pair complementarity, or,

for example, in the case of binding to DNA duplexes, through specific interactions in the major groove of the double helix. In general, these methods refer to the range of techniques generally employed in the art, and include any methods that rely on specific binding to oligonucleotide sequences.

5 An antisense construct of the present application can be delivered, for example, as an expression plasmid which, when transcribed in the cell, produces RNA which is complementary to at least a unique portion of the cellular mRNA which encodes a POSH or POSH-AP polypeptide. Alternatively, the antisense construct is an oligonucleotide probe, which is generated ex vivo and which, when 10 introduced into the cell causes inhibition of expression by hybridizing with the mRNA and/or genomic sequences of a POSH or POSH-AP nucleic acid. Such oligonucleotide probes are preferably modified oligonucleotides, which are resistant to endogenous nucleases, e.g., exonucleases and/or endonucleases, and are therefore stable in vivo. Exemplary nucleic acid molecules for use as antisense 15 oligonucleotides are phosphoramidate, phosphothioate and methylphosphonate analogs of DNA (see also U.S. Patents 5,176,996; 5,264,564; and 5,256,775). Additionally, general approaches to constructing oligomers useful in antisense therapy have been reviewed, for example, by Van der Krol et al. (1988) BioTechniques 6:958-976; and Stein et al. (1988) Cancer Res 48:2659- 2668.

20 With respect to antisense DNA, oligodeoxyribonucleotides derived from the translation initiation site, e.g., between the -10 and +10 regions of the target gene, are preferred. Antisense approaches involve the design of oligonucleotides (either DNA or RNA) that are complementary to mRNA encoding a POSH or POSH-AP polypeptide. The antisense oligonucleotides will bind to the mRNA transcripts and 25 prevent translation. Absolute complementarity, although preferred, is not required. In the case of double-stranded antisense nucleic acids, a single strand of the duplex DNA may thus be tested, or triplex formation may be assayed. The ability to hybridize will depend on both the degree of complementarity and the length of the antisense nucleic acid. Generally, the longer the hybridizing nucleic acid, the more 30 base mismatches with an RNA it may contain and still form a stable duplex (or triplex, as the case may be). One skilled in the art can ascertain a tolerable degree of

mismatch by use of standard procedures to determine the melting point of the hybridized complex.

Oligonucleotides that are complementary to the 5' end of the mRNA, e.g., the 5' untranslated sequence up to and including the AUG initiation codon, should work 5 most efficiently at inhibiting translation. However, sequences complementary to the 3' untranslated sequences of mRNAs have recently been shown to be effective at inhibiting translation of mRNAs as well. (Wagner, R. 1994. Nature 372:333). Therefore, oligonucleotides complementary to either the 5' or 3' untranslated, non-coding regions of a gene could be used in an antisense approach to inhibit translation 10 of that mRNA. Oligonucleotides complementary to the 5' untranslated region of the mRNA should include the complement of the AUG start codon. Antisense oligonucleotides complementary to mRNA coding regions are less efficient inhibitors of translation but could also be used in accordance with the application. Whether designed to hybridize to the 5', 3' or coding region of mRNA, antisense 15 nucleic acids should be at least six nucleotides in length, and are preferably less than about 100 and more preferably less than about 50, 25, 17 or 10 nucleotides in length.

It is preferred that in vitro studies are first performed to quantitate the ability 20 of the antisense oligonucleotide to inhibit gene expression. It is preferred that these studies utilize controls that distinguish between antisense gene inhibition and nonspecific biological effects of oligonucleotides. It is also preferred that these studies compare levels of the target RNA or protein with that of an internal control RNA or protein. Results obtained using the antisense oligonucleotide may be compared with those obtained using a control oligonucleotide. It is preferred that the control oligonucleotide is of approximately the same length as the test 25 oligonucleotide and that the nucleotide sequence of the oligonucleotide differs from the antisense sequence no more than is necessary to prevent specific hybridization to the target sequence.

The antisense oligonucleotides can be DNA or RNA or chimeric mixtures or 30 derivatives or modified versions thereof, single-stranded or double-stranded. The oligonucleotide can be modified at the base moiety, sugar moiety, or phosphate backbone, for example, to improve stability of the molecule, hybridization, etc. The oligonucleotide may include other appended groups such as peptides (e.g., for

targeting host cell receptors), or agents facilitating transport across the cell membrane (see, e.g., Letsinger et al., 1989, Proc. Natl. Acad. Sci. U.S.A. 86:6553-6556; Lemaitre et al., 1987, Proc. Natl. Acad. Sci. 84:648-652; PCT Publication No. W088/09810, published December 15, 1988) or the blood- brain barrier (see, e.g.,  
5 PCT Publication No. W089/10134, published April 25, 1988), hybridization-triggered cleavage agents. (See, e.g., Krol et al., 1988, BioTechniques 6:958- 976)  
or intercalating agents. (See, e.g., Zon, 1988, Pharm. Res. 5:539-549). To this end,  
the oligonucleotide may be conjugated to another molecule, e.g., a peptide,  
hybridization triggered cross-linking agent, transport agent, hybridization-triggered  
10 cleavage agent, etc.

The antisense oligonucleotide may comprise at least one modified base moiety which is selected from the group including but not limited to 5-fluorouracil, 5- bromouracil, 5-chlorouracil, 5-iodouracil, hypoxanthine, xantine, 4-acetylcytosine, 5- (carboxyhydroxyethyl) uracil, 5-carboxymethylaminomethyl-2-thiouridine, 5- carboxymethylaminomethyluracil, dihydrouracil, beta-D-galactosylqueosine, inosine, N6- isopentenyladenine, 1-methylguanine, 1-methylinosine, 2,2-dimethylguanine, 2-methyladenine, 2-methylguanine, 3-methylcytosine, 5-methylcytosine, N6-adenine, 7-methylguanine, 5-methylaminomethyluracil, 5-methoxyaminomethyl-2-thiouracil, beta-D-mannosylqueosine, 5'-methoxycarboxymethyluracil, 5-methoxyuracil, 2-methylthio-N6- isopentenyladenine, uracil-5-oxyacetic acid (v), wybutoxosine, pseudouracil, queosine, 2-thiocytosine, 5-methyl-2-thiouracil, 2-thiouracil, 4-thiouracil, 5-methyluracil, uracil-5- oxyacetic acid methylester, uracil-5-oxyacetic acid (v), 5-methyl-2-thiouracil, 3-(3-amino-3- N-2-carboxypropyl) uracil, (acp3)w, and 2,6-diaminopurine.  
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The antisense oligonucleotide may also comprise at least one modified sugar moiety selected from the group including but not limited to arabinose, 2-fluoroarabinose, xylulose, and hexose.

The antisense oligonucleotide can also contain a neutral peptide-like backbone. Such molecules are termed peptide nucleic acid (PNA)-oligomers and are described, e.g., in Perry-O'Keefe et al. (1996) Proc. Natl. Acad. Sci. U.S.A. 93:14670 and in Eglom et al. (1993) Nature 365:566. One advantage of PNA  
30

oligomers is their capability to bind to complementary DNA essentially independently from the ionic strength of the medium due to the neutral backbone of the DNA. In yet another embodiment, the antisense oligonucleotide comprises at least one modified phosphate backbone selected from the group consisting of a phosphorothioate, a phosphorodithioate, a phosphoramidothioate, a phosphoramidate, a phosphordiamidate, a methylphosphonate, an alkyl phosphotriester, and a formacetal or analog thereof.

In yet a further embodiment, the antisense oligonucleotide is an alpha-anomeric oligonucleotide. An alpha-anomeric oligonucleotide forms specific double-stranded hybrids with complementary RNA in which, contrary to the usual antiparallel orientation, the strands run parallel to each other (Gautier et al., 1987, Nucl. Acids Res. 15:6625-6641). The oligonucleotide is a 2'-0-methylribonucleotide (Inoue et al., 1987, Nucl. Acids Res. 15:6131-6148), or a chimeric RNA-DNA analogue (Inoue et al., 1987, FEBS Lett. 215:327-330).

While antisense nucleotides complementary to the coding region of a POSH or POSH-AP mRNA sequence can be used, those complementary to the transcribed untranslated region may also be used.

In certain instances, it may be difficult to achieve intracellular concentrations of the antisense sufficient to suppress translation on endogenous mRNAs. Therefore a preferred approach utilizes a recombinant DNA construct in which the antisense oligonucleotide is placed under the control of a strong pol III or pol II promoter. The use of such a construct to transfet target cells will result in the transcription of sufficient amounts of single stranded RNAs that will form complementary base pairs with the endogenous potential drug target transcripts and thereby prevent translation. For example, a vector can be introduced such that it is taken up by a cell and directs the transcription of an antisense RNA. Such a vector can remain episomal or become chromosomally integrated, as long as it can be transcribed to produce the desired antisense RNA. Such vectors can be constructed by recombinant DNA technology methods standard in the art. Vectors can be plasmid, viral, or others known in the art, used for replication and expression in mammalian cells. Expression of the sequence encoding the antisense RNA can be by any promoter known in the art to act in mammalian, preferably human cells. Such promoters can

be inducible or constitutive. Such promoters include but are not limited to: the SV40 early promoter region (Benoist and Chambon, 1981, Nature 290:304-310), the promoter contained in the 3' long terminal repeat of Rous sarcoma virus (Yamamoto et al., 1980, Cell 22:787-797), the herpes thymidine kinase promoter 5 (Wagner et al., 1981, Proc. Natl. Acad. Sci. U.S.A. 78:1441-1445), the regulatory sequences of the metallothionein gene (Brinster et al, 1982, Nature 296:39-42), etc. Any type of plasmid, cosmid, YAC or viral vector can be used to prepare the recombinant DNA construct, which can be introduced directly into the tissue site.

Alternatively, POSH or POSH-AP gene expression can be reduced by 10 targeting deoxyribonucleotide sequences complementary to the regulatory region of the gene (i.e., the promoter and/or enhancers) to form triple helical structures that prevent transcription of the gene in target cells in the body. (See generally, Helene, C. 1991, Anticancer Drug Des., 6(6):569-84; Helene, C., et al., 1992, Ann. N.Y. Acad. Sci., 660:27-36; and Maher, L.J., 1992, Bioassays 14(12):807-15).

15 Nucleic acid molecules to be used in triple helix formation for the inhibition of transcription are preferably single stranded and composed of deoxyribonucleotides. The base composition of these oligonucleotides should promote triple helix formation via Hoogsteen base pairing rules, which generally require sizable stretches of either purines or pyrimidines to be present on one strand 20 of a duplex. Nucleotide sequences may be pyrimidine-based, which will result in TAT and CGC triplets across the three associated strands of the resulting triple helix. The pyrimidine-rich molecules provide base complementarity to a purine-rich region of a single strand of the duplex in a parallel orientation to that strand. In addition, nucleic acid molecules may be chosen that are purine- rich, for example, 25 containing a stretch of G residues. These molecules will form a triple helix with a DNA duplex that is rich in GC pairs, in which the majority of the purine residues are located on a single strand of the targeted duplex, resulting in CGC triplets across the three strands in the triplex.

30 Alternatively, POSH or POSH-AP sequences that can be targeted for triple helix formation may be increased by creating a so called "switchback" nucleic acid molecule. Switchback molecules are synthesized in an alternating 5'-3', 3'-5' manner, such that they base pair with first one strand of a duplex and then the other,

eliminating the necessity for a sizable stretch of either purines or pyrimidines to be present on one strand of a duplex.

A further aspect of the application relates to the use of DNA enzymes to inhibit expression of a POSH or POSH-AP gene. DNA enzymes incorporate some 5 of the mechanistic features of both antisense and ribozyme technologies. DNA enzymes are designed so that they recognize a particular target nucleic acid sequence, much like an antisense oligonucleotide, however much like a ribozyme they are catalytic and specifically cleave the target nucleic acid.

There are currently two basic types of DNA enzymes, and both of these were 10 identified by Santoro and Joyce (see, for example, US Patent No. 6110462). The 10-23 DNA enzyme comprises a loop structure which connect two arms. The two arms provide specificity by recognizing the particular target nucleic acid sequence while the loop structure provides catalytic function under physiological conditions.

Briefly, to design an ideal DNA enzyme that specifically recognizes and 15 cleaves a target nucleic acid, one of skill in the art must first identify the unique target sequence. This can be done using the same approach as outlined for antisense oligonucleotides. Preferably, the unique or substantially sequence is a G/C rich of approximately 18 to 22 nucleotides. High G/C content helps insure a stronger interaction between the DNA enzyme and the target sequence.

When synthesizing the DNA enzyme, the specific antisense recognition 20 sequence that will target the enzyme to the message is divided so that it comprises the two arms of the DNA enzyme, and the DNA enzyme loop is placed between the two specific arms.

Methods of making and administering DNA enzymes can be found, for 25 example, in US 6110462. Similarly, methods of delivery DNA ribozymes in vitro or in vivo include methods of delivery RNA ribozyme, as outlined in detail above. Additionally, one of skill in the art will recognize that, like antisense oligonucleotide, DNA enzymes can be optionally modified to improve stability and improve resistance to degradation.

Antisense RNA and DNA, ribozyme, RNAi and triple helix molecules of the 30 application may be prepared by any method known in the art for the synthesis of DNA and RNA molecules. These include techniques for chemically synthesizing

oligodeoxyribonucleotides and oligoribonucleotides well known in the art such as for example solid phase phosphoramidite chemical synthesis. Alternatively, RNA molecules may be generated by in vitro and in vivo transcription of DNA sequences encoding the antisense RNA molecule. Such DNA sequences may be incorporated 5 into a wide variety of vectors which incorporate suitable RNA polymerase promoters such as the T7 or SP6 polymerase promoters. Alternatively, antisense cDNA constructs that synthesize antisense RNA constitutively or inducibly, depending on the promoter used, can be introduced stably into cell lines. Moreover, various well-known modifications to nucleic acid molecules may be introduced as a 10 means of increasing intracellular stability and half-life. Possible modifications include but are not limited to the addition of flanking sequences of ribonucleotides or deoxyribonucleotides to the 5' and/or 3' ends of the molecule or the use of phosphorothioate or 2' O-methyl rather than phosphodiester linkages within the oligodeoxyribonucleotide backbone.

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#### 6. Drug Screening Assays

In certain aspects, the present application provides assays for identifying therapeutic agents which either interfere with or promote POSH or POSH-AP function. In certain aspects, the present application also provides assays for 20 identifying therapeutic agents which either interfere with or promote the complex formation between a POSH polypeptide and a POSH-AP polypeptide.

In certain embodiments, agents of the application are antiviral agents, optionally interfering with viral maturation, and preferably where the virus is an envelope virus, and optionally a retrovirus or an RNA virus. In other 25 embodiments, agents of the application are anticancer agents. In further embodiments, agents of the application inhibit the progression of a neurodegenerative disorder. In certain embodiments, an antiviral or anticancer agent or an agent that inhibits the progression of a neurodegenerative disorder interferes with the ubiquitin ligase catalytic activity of POSH (e.g., POSH auto-ubiquitination 30 or transfer to a target protein). In other embodiments, agents disclosed herein inhibit or promote POSH and POSH-AP mediated cellular processes such as apoptosis and protein processing in the secretory pathway.

In certain preferred embodiments, an antiviral agent interferes with the interaction between POSH and a POSH-AP polypeptide, for example an antiviral agent may disrupt or render irreversible interaction between a POSH polypeptide and POSH-AP polypeptide (as in the case of a POSH dimer, a heterodimer of two different POSH polypeptides, homomultimers and heteromultimers). In further embodiments, agents of the application are anti-apoptotic agents, optionally interfering with JNK and/or NF- $\kappa$ B signaling. In yet additional embodiments, agents of the application interfere with the signaling of a GTPase, such as Rac or Ras, optionally disrupting the interaction between a POSH polypeptide and a Rac protein. In certain embodiments, agents of the application modulate the ubiquitin ligase activity of POSH and may be used to treat certain diseases related to ubiquitin ligase activity. In certain embodiments, agents of the application interfere with the trafficking of a protein through the secretory pathway.

In certain embodiments, the application provides assays to identify, optimize or otherwise assess agents that increase or decrease a ubiquitin-related activity of a POSH polypeptide. Ubiquitin-related activities of POSH polypeptides may include the self-ubiquitination activity of a POSH polypeptide, generally involving the transfer of ubiquitin from an E2 enzyme to the POSH polypeptide, and the ubiquitination of a target protein, generally involving the transfer of a ubiquitin from a POSH polypeptide to the target protein. In certain embodiments, a POSH activity is mediated, at least in part, by a POSH RING domain.

In certain embodiments, an assay comprises forming a mixture comprising a POSH polypeptide, an E2 polypeptide and a source of ubiquitin (which may be the E2 polypeptide pre-complexed with ubiquitin). Optionally the mixture comprises an E1 polypeptide and optionally the mixture comprises a target polypeptide. Additional components of the mixture may be selected to provide conditions consistent with the ubiquitination of the POSH polypeptide. One or more of a variety of parameters may be detected, such as POSH-ubiquitin conjugates, E2-ubiquitin thioesters, free ubiquitin and target polypeptide-ubiquitin complexes. The term "detect" is used herein to include a determination of the presence or absence of the subject of detection (e.g., POSH-ubiquitin, E2-ubiquitin, etc.), a quantitative measure of the amount of the subject of detection, or a mathematical calculation of

the presence, absence or amount of the subject of detection, based on the detection of other parameters. The term "detect" includes the situation wherein the subject of detection is determined to be absent or below the level of sensitivity. Detection may comprise detection of a label (e.g., fluorescent label, radioisotope label, and other described below), resolution and identification by size (e.g., SDS-PAGE, mass spectroscopy), purification and detection, and other methods that, in view of this specification, will be available to one of skill in the art. For instance, radioisotope labeling may be measured by scintillation counting, or by densitometry after exposure to a photographic emulsion, or by using a device such as a Phosphorimager. Likewise, densitometry may be used to measure bound ubiquitin following a reaction with an enzyme label substrate that produces an opaque product when an enzyme label is used. In a preferred embodiment, an assay comprises detecting the POSH-ubiquitin conjugate.

In certain embodiments, an assay comprises forming a mixture comprising a POSH polypeptide, a target polypeptide and a source of ubiquitin (which may be the POSH polypeptide pre-complexed with ubiquitin). Optionally the mixture comprises an E1 and/or E2 polypeptide and optionally the mixture comprises an E2-ubiquitin thioester. Additional components of the mixture may be selected to provide conditions consistent with the ubiquitination of the target polypeptide. One or more of a variety of parameters may be detected, such as POSH-ubiquitin conjugates and target polypeptide-ubiquitin conjugates. In a preferred embodiment, an assay comprises detecting the target polypeptide-ubiquitin conjugate. In another preferred embodiment, an assay comprises detecting the POSH-ubiquitin conjugate.

An assay described above may be used in a screening assay to identify agents that modulate a ubiquitin-related activity of a POSH polypeptide. A screening assay will generally involve adding a test agent to one of the above assays, or any other assay designed to assess a ubiquitin-related activity of a POSH polypeptide. The parameter(s) detected in a screening assay may be compared to a suitable reference. A suitable reference may be an assay run previously, in parallel or later that omits the test agent. A suitable reference may also be an average of previous measurements in the absence of the test agent. In general the components of a screening assay mixture may be added in any order consistent with the overall

activity to be assessed, but certain variations may be preferred. For example, in certain embodiments, it may be desirable to pre-incubate the test agent and the E3 (e.g., the POSH polypeptide), followed by removing the test agent and addition of other components to complete the assay. In this manner, the effects of the agent solely on the POSH polypeptide may be assessed. In certain preferred embodiments, a screening assay for an antiviral agent employs a target polypeptide comprising an L domain, and preferably an HIV L domain.

In certain embodiments, an assay is performed in a high-throughput format. For example, one of the components of a mixture may be affixed to a solid substrate and one or more of the other components is labeled. For example, the POSH polypeptide may be affixed to a surface, such as a 96-well plate, and the ubiquitin is in solution and labeled. An E2 and E1 are also in solution, and the POSH-ubiquitin conjugate formation may be measured by washing the solid surface to remove uncomplexed labeled ubiquitin and detecting the ubiquitin that remains bound. Other variations may be used. For example, the amount of ubiquitin in solution may be detected. In certain embodiments, the formation of ubiquitin complexes may be measured by an interactive technique, such as FRET, wherein a ubiquitin is labeled with a first label and the desired complex partner (e.g., POSH polypeptide or target polypeptide) is labeled with a second label, wherein the first and second label interact when they come into close proximity to produce an altered signal. In FRET, the first and second labels are fluorophores. FRET is described in greater detail below. The formation of polyubiquitin complexes may be performed by mixing two or more pools of differentially labeled ubiquitin that interact upon formation of a polyubiquitin (see, e.g., US Patent Publication 20020042083). High-throughput may be achieved by performing an interactive assay, such as FRET, in solution as well. In addition, if a polypeptide in the mixture, such as the POSH polypeptide or target polypeptide, is readily purifiable (e.g., with a specific antibody or via a tag such as biotin, FLAG, polyhistidine, etc.), the reaction may be performed in solution and the tagged polypeptide rapidly isolated, along with any polypeptides, such as ubiquitin, that are associated with the tagged polypeptide. Proteins may also be resolved by SDS-PAGE for detection.

In certain embodiments, the ubiquitin is labeled, either directly or indirectly. This typically allows for easy and rapid detection and measurement of ligated ubiquitin, making the assay useful for high-throughput screening applications. As described above, certain embodiments may employ one or more tagged or labeled proteins. A "tag" is meant to include moieties that facilitate rapid isolation of the tagged polypeptide. A tag may be used to facilitate attachment of a polypeptide to a surface. A "label" is meant to include moieties that facilitate rapid detection of the labeled polypeptide. Certain moieties may be used both as a label and a tag (e.g., epitope tags that are readily purified and detected with a well-characterized antibody). Biotinylation of polypeptides is well known, for example, a large number of biotinylation agents are known, including amine-reactive and thiol-reactive agents, for the biotinylation of proteins, nucleic acids, carbohydrates, carboxylic acids; see chapter 4, Molecular Probes Catalog, Haugland, 6th Ed. 1996, hereby incorporated by reference. A biotinylated substrate can be attached to a biotinylated component via avidin or streptavidin. Similarly, a large number of haptenylation reagents are also known.

An "E1" is a ubiquitin activating enzyme. In a preferred embodiment, E1 is capable of transferring ubiquitin to an E2. In a preferred embodiment, E1 forms a high energy thiolester bond with ubiquitin, thereby "activating" the ubiquitin. An "E2" is a ubiquitin carrier enzyme (also known as a ubiquitin conjugating enzyme). In a preferred embodiment, ubiquitin is transferred from E1 to E2. In a preferred embodiment, the transfer results in a thiolester bond formed between E2 and ubiquitin. In a preferred embodiment, E2 is capable of transferring ubiquitin to a POSH polypeptide.

In an alternative embodiment, a POSH polypeptide, E2 or target polypeptide is bound to a bead, optionally with the assistance of a tag. Following ligation, the beads may be separated from the unbound ubiquitin and the bound ubiquitin measured. In a preferred embodiment, POSH polypeptide is bound to beads and the composition used includes labeled ubiquitin. In this embodiment, the beads with bound ubiquitin may be separated using a fluorescence-activated cell sorting (FACS) machine. Methods for such use are described in U.S. patent application Ser.

No. 09/047,119, which is hereby incorporated in its entirety. The amount of bound ubiquitin can then be measured.

In a screening assay, the effect of a test agent may be assessed by, for example, assessing the effect of the test agent on kinetics, steady-state and/or endpoint of the reaction.

The components of the various assay mixtures provided herein may be combined in varying amounts. In a preferred embodiment, ubiquitin (or E2 complexed ubiquitin) is combined at a final concentration of from 5 to 200 ng per 100 microliter reaction solution. Optionally E1 is used at a final concentration of 10 from 1 to 50 ng per 100 microliter reaction solution. Optionally E2 is combined at a final concentration of 10 to 100 ng per 100 microliter reaction solution, more preferably 10-50 ng per 100 microliter reaction solution. In a preferred embodiment, POSH polypeptide is combined at a final concentration of from 1 to 500 ng per 100 microliter reaction solution.

Generally, an assay mixture is prepared so as to favor ubiquitin ligase activity and/or ubiquitination activity. Generally, this will be physiological conditions, such as 50 – 200 mM salt (e.g., NaCl, KCl), pH of between 5 and 9, and preferably between 6 and 8. Such conditions may be optimized through trial and error. Incubations may be performed at any temperature which facilitates optimal activity, typically between 4 and 40 °C. Incubation periods are selected for optimum activity, but may also be optimized to facilitate rapid high throughput screening. Typically between 0.5 and 1.5 hours will be sufficient. A variety of other reagents may be included in the compositions. These include reagents like salts, solvents, buffers, neutral proteins, e.g., albumin, detergents, etc. which may be used to facilitate optimal ubiquitination enzyme activity and/or reduce non-specific or background interactions. Also reagents that otherwise improve the efficiency of the assay, such as protease inhibitors, nuclease inhibitors, anti-microbial agents, etc., may be used. The compositions will also preferably include adenosine tri-phosphate (ATP). The mixture of components may be added in any order that promotes ubiquitin ligase activity or optimizes identification of candidate modulator effects. In a preferred embodiment, ubiquitin is provided in a reaction buffer solution, followed by addition of the ubiquitination enzymes. In an alternate preferred embodiment,

ubiquitin is provided in a reaction buffer solution, a candidate modulator is then added, followed by addition of the ubiquitination enzymes.

In general, a test agent that decreases a POSH ubiquitin-related activity may be used to inhibit POSH function in vivo, while a test agent that increases a POSH ubiquitin-related activity may be used to stimulate POSH function in vivo. Test agent may be modified for use in vivo, e.g., by addition of a hydrophobic moiety, such as an ester.

In certain embodiments, a ubiquitination assay as described above for POSH can similarly be conducted for a Cbl-b, a SIAH1, or a TTC3 polypeptide. In certain 10 embodiments, the application provides assays to identify, optimize or otherwise assess agents that increase or decrease a ubiquitin-related activity of a Cbl-b, a SIAH1, or a TTC3 polypeptide. Ubiquitin-related activities of Cbl-b, SIAH1, or TTC3 polypeptides may include the self-ubiquitination activity of a Cbl-b, SIAH1, or 15 TTC3 polypeptide, generally involving the transfer of ubiquitin from an E2 enzyme to the respective Cbl-b, SIAH1, or TTC3 polypeptide, and the ubiquitination of a target protein, e.g., the p85 subunit of PI3K, e.g., synaptophysin, generally involving the transfer of a ubiquitin from a Cbl-b, SIAH1, or TTC3 polypeptide to the target protein, e.g., the p85 subunit of PI3K, e.g., synaptophysin, e.g., HERPUD1. In certain embodiments, a Cbl-b, a SIAH1, or a TTC3 activity is 20 mediated, at least in part, by a RING domain of a Cbl-b, a SIAH1, or a TTC3, respectively.

An additional POSH-AP may be added to a POSH ubiquitination assay to 25 assess the effect of the POSH-AP (e.g., PRKAR1A, PRKACA, or PRKACB) on POSH-mediated ubiquitination and/or to assess whether the POSH-AP is a target for POSH-mediated ubiquitination (e.g., HERPUD1, e.g., PKA).

Certain embodiments of the application relate to assays for identifying agents that bind to a POSH or POSH-AP polypeptide, optionally a particular domain of POSH such as an SH3 or RING domain or a particular domain of a POSH-AP, particularly a kinase catalytic domain or ATP binding domain. In preferred 30 embodiments, a POSH polypeptide is a polypeptide comprising the fourth SH3 domain of hPOSH (SEQ ID NO: 30). A wide variety of assays may be used for this purpose, including labeled in vitro protein-protein binding assays, electrophoretic  
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mobility shift assays, immunoassays for protein binding, and the like. The purified protein may also be used for determination of three-dimensional crystal structure, which can be used for modeling intermolecular interactions and design of test agents. In one embodiment, an assay detects agents which inhibit interaction of one or more subject POSH polypeptides with a POSH-AP. In another embodiment, the assay detects agents which modulate the intrinsic biological activity of a POSH polypeptide or POSH complex, such as an enzymatic activity, binding to other cellular components, cellular compartmentalization, and the like.

Certain embodiments of the application relate to assays for identifying agents that modulate a POSH-AP polypeptide such as a PKA subunit polypeptide. Preferred PKA subunit polypeptides include PRKAR1A, PRKACA, and PRKACB. Exemplary assays used for this purpose may include detecting phosphorylation of PKA subunit, kinase activity of the PKA subunit, ability of the PKA subunit to elicit downstream signaling of the PKA pathway, and the like. For example, activity of protein kinase A can be assayed either in vitro or in vivo. PKA activity can be determined by detecting phosphorylation of a PKA specific substrate. The specific PKA substrate can be any convenient peptide with a serine that is recognized as a phosphorylation site by PKA. For example, the peptide substrate can have the sequence: Leu-Arg-Arg-Ala-Ser-Leu-Gly.

In one aspect, the application provides methods and compositions for the identification of compositions that interfere with the function of POSH or POSH-AP polypeptides. Given the role of POSH polypeptides in viral production, compositions that perturb the formation or stability of the protein-protein interactions between POSH polypeptides and the proteins that they interact with, such as POSH-APs, and particularly POSH complexes comprising a viral protein, are candidate pharmaceuticals for the treatment of viral infections.

While not wishing to be bound to mechanism, it is postulated that POSH polypeptides promote the assembly of protein complexes that are important in release of virions and other biological processes. Complexes of the application may include a combination of a POSH polypeptide and a POSH-AP. Exemplary complexes may comprise one or more of the following: a POSH polypeptide (as in

the case of a POSH dimer, a heterodimer of two different POSH, homomultimers and heteromultimers); a HERPUD1 polypeptide; or an MSTP028 polypeptide.

In an assay for an antiviral or antiapoptotic agent, the test agent is assessed for its ability to disrupt or inhibit the formation of a complex of a POSH polypeptide and a small GTPase, such as a Rac polypeptide, particularly a human Rac polypeptide, such as Rac1.

A variety of assay formats will suffice and, in light of the present disclosure, those not expressly described herein will nevertheless be comprehended by one of ordinary skill in the art. Assay formats which approximate such conditions as formation of protein complexes, enzymatic activity, and even a POSH polypeptide-mediated membrane reorganization or vesicle formation activity, may be generated in many different forms, and include assays based on cell-free systems, e.g., purified proteins or cell lysates, as well as cell-based assays which utilize intact cells. Simple binding assays can also be used to detect agents which bind to POSH. Such binding assays may also identify agents that act by disrupting the interaction between a POSH polypeptide and a POSH interacting protein, or the binding of a POSH polypeptide or complex to a substrate. Agents to be tested can be produced, for example, by bacteria, yeast or other organisms (e.g., natural products), produced chemically (e.g., small molecules, including peptidomimetics), or produced recombinantly. In a preferred embodiment, the test agent is a small organic molecule, e.g., other than a peptide or oligonucleotide, having a molecular weight of less than about 2,000 daltons.

In many drug screening programs which test libraries of compounds and natural extracts, high throughput assays are desirable in order to maximize the number of compounds surveyed in a given period of time. Assays of the present application which are performed in cell-free systems, such as may be developed with purified or semi-purified proteins or with lysates, are often preferred as "primary" screens in that they can be generated to permit rapid development and relatively easy detection of an alteration in a molecular target which is mediated by a test compound. Moreover, the effects of cellular toxicity and/or bioavailability of the test compound can be generally ignored in the in vitro system, the assay instead being focused primarily on the effect of the drug on the molecular target as may be

manifest in an alteration of binding affinity with other proteins or changes in enzymatic properties of the molecular target.

In preferred in vitro embodiments of the present assay, a reconstituted POSH complex comprises a reconstituted mixture of at least semi-purified proteins. By semi-purified, it is meant that the proteins utilized in the reconstituted mixture have been previously separated from other cellular or viral proteins. For instance, in contrast to cell lysates, the proteins involved in POSH complex formation are present in the mixture to at least 50% purity relative to all other proteins in the mixture, and more preferably are present at 90-95% purity. In certain embodiments of the subject method, the reconstituted protein mixture is derived by mixing highly purified proteins such that the reconstituted mixture substantially lacks other proteins (such as of cellular or viral origin) which might interfere with or otherwise alter the ability to measure POSH complex assembly and/or disassembly.

Assaying POSH complexes, in the presence and absence of a candidate inhibitor, can be accomplished in any vessel suitable for containing the reactants. Examples include microtitre plates, test tubes, and micro-centrifuge tubes.

In one embodiment of the present application, drug screening assays can be generated which detect inhibitory agents on the basis of their ability to interfere with assembly or stability of the POSH complex. In an exemplary binding assay, the compound of interest is contacted with a mixture comprising a POSH polypeptide and at least one interacting polypeptide. Detection and quantification of POSH complexes provides a means for determining the compound's efficacy at inhibiting (or potentiating) interaction between the two polypeptides. The efficacy of the compound can be assessed by generating dose response curves from data obtained using various concentrations of the test compound. Moreover, a control assay can also be performed to provide a baseline for comparison. In the control assay, the formation of complexes is quantitated in the absence of the test compound.

Complex formation between the POSH polypeptides and a substrate polypeptide may be detected by a variety of techniques, many of which are effectively described above. For instance, modulation in the formation of complexes can be quantitated using, for example, detectably labeled proteins (e.g., radiolabeled, fluorescently labeled, or enzymatically labeled), by immunoassay, or by

chromatographic detection. Surface plasmon resonance systems, such as those available from Biacore International AB (Uppsala, Sweden), may also be used to detect protein-protein interaction.

Often, it will be desirable to immobilize one of the polypeptides to facilitate separation of complexes from uncomplexed forms of one of the proteins, as well as to accommodate automation of the assay. In an illustrative embodiment, a fusion protein can be provided which adds a domain that permits the protein to be bound to an insoluble matrix. For example, GST-POSH fusion proteins can be adsorbed onto glutathione sepharose beads (Sigma Chemical, St. Louis, MO) or glutathione derivatized microtitre plates, which are then combined with a potential interacting protein, e.g., an <sup>35</sup>S-labeled polypeptide, and the test compound and incubated under conditions conducive to complex formation. Following incubation, the beads are washed to remove any unbound interacting protein, and the matrix bead-bound radiolabel determined directly (e.g., beads placed in scintillant), or in the supernatant after the complexes are dissociated, e.g., when microtitre plate is used. Alternatively, after washing away unbound protein, the complexes can be dissociated from the matrix, separated by SDS-PAGE gel, and the level of interacting polypeptide found in the matrix-bound fraction quantitated from the gel using standard electrophoretic techniques.

In a further embodiment, agents that bind to a POSH or POSH-AP may be identified by using an immobilized POSH or POSH-AP. In an illustrative embodiment, a fusion protein can be provided which adds a domain that permits the protein to be bound to an insoluble matrix. For example, GST-POSH fusion proteins can be adsorbed onto glutathione sepharose beads (Sigma Chemical, St. Louis, MO) or glutathione derivatized microtitre plates, which are then combined with a potential labeled binding agent and incubated under conditions conducive to binding. Following incubation, the beads are washed to remove any unbound agent, and the matrix bead-bound label determined directly, or in the supernatant after the bound agent is dissociated.

In yet another embodiment, the POSH polypeptide and potential interacting polypeptide can be used to generate an interaction trap assay (see also, U.S. Patent NO: 5,283,317; Zervos et al. (1993) Cell 72:223-232; Madura et al. (1993) J Biol

Chem 268:12046-12054; Bartel et al. (1993) Biotechniques 14:920-924; and Iwabuchi et al. (1993) Oncogene 8:1693-1696), for subsequently detecting agents which disrupt binding of the proteins to one and other.

In particular, the method makes use of chimeric genes which express hybrid proteins. To illustrate, a first hybrid gene comprises the coding sequence for a DNA-binding domain of a transcriptional activator can be fused in frame to the coding sequence for a "bait" protein, e.g., a POSH polypeptide of sufficient length to bind to a potential interacting protein. The second hybrid protein encodes a transcriptional activation domain fused in frame to a gene encoding a "fish" protein, e.g., a potential interacting protein of sufficient length to interact with the POSH polypeptide portion of the bait fusion protein. If the bait and fish proteins are able to interact, e.g., form a POSH complex, they bring into close proximity the two domains of the transcriptional activator. This proximity causes transcription of a reporter gene which is operably linked to a transcriptional regulatory site responsive to the transcriptional activator, and expression of the reporter gene can be detected and used to score for the interaction of the bait and fish proteins.

One aspect of the present application provides reconstituted protein preparations including a POSH polypeptide and one or more interacting polypeptides.

In still further embodiments of the present assay, the POSH complex is generated in whole cells, taking advantage of cell culture techniques to support the subject assay. For example, as described below, the POSH complex can be constituted in a eukaryotic cell culture system, including mammalian and yeast cells. Often it will be desirable to express one or more viral proteins (e.g., Gag or Env) in such a cell along with a subject POSH polypeptide. It may also be desirable to infect the cell with a virus of interest. Advantages to generating the subject assay in an intact cell include the ability to detect inhibitors which are functional in an environment more closely approximating that which therapeutic use of the inhibitor would require, including the ability of the agent to gain entry into the cell. Furthermore, certain of the in vivo embodiments of the assay, such as examples given below, are amenable to high through-put analysis of candidate agents.

The components of the POSH complex can be endogenous to the cell selected to support the assay. Alternatively, some or all of the components can be derived from exogenous sources. For instance, fusion proteins can be introduced into the cell by recombinant techniques (such as through the use of an expression vector), as well as by microinjecting the fusion protein itself or mRNA encoding the fusion protein.

In many embodiments, a cell is manipulated after incubation with a candidate agent and assayed for a POSH or POSH-AP activity. In certain embodiments, a POSH-AP, such as PTPN12, is a tyrosine phosphatase. Tyrosine phosphatase activity may be assessed by incubating a cell lysate, which has optionally been treated with perva-nadate to stimulate tyrosine phosphorylation, with a POSH-AP that has tyrosine phosphatase activity, immunoprecipitating the substrate protein and immunoblotting for the presence of phosphorylated tyrosine. Alternatively, tyrosine phosphatase activity may be assessed by the substrate trapping method. The substrate trapping method employs catalytically inactive mutants of a tyrosine phosphatase (e.g., a POSH-AP such as PTPN12). The catalytically inactive phosphatase mutant is immobilized on a solid matrix (e.g., AG25-protein A-Sepharose beads) and incubated with a substrate protein. The solid matrix to which the catalytically inactive phosphatase is bound is isolated and subjected to SDS-PAGE and immunoblotting for the presence of the substrate protein. The proteins employed in a phosphatase assay may optionally be purified proteins. (Lyons, PD et al (2001) J Biol Chem 246:24422-31; Garton, AJ et al (1996) Mol Cell Biol 16:6408-18).

In many embodiments, a cell is manipulated after incubation with a candidate agent and assayed for a POSH or POSH-AP activity. In certain embodiments a POSH or POSH-AP activity is represented by production of virus like particles. As demonstrated herein, an agent that disrupts POSH or POSH-AP activity can cause a decrease in the production of virus like particles. Other bioassays for POSH or POSH-AP activities may include apoptosis assays (e.g., cell survival assays, apoptosis reporter gene assays, etc.) and NF- $\kappa$ B nuclear localization assays (see e.g., Tapon et al. (1998) EMBO J. 17: 1395-1404). One apoptosis assay that may be used to assess TGN-associated protein activity is the TUNEL assay, which is used to

detect the presence of apoptotic cell death. In the TUNEL assay, the enzyme terminal deoxynucleotidyl transferase labels 3'-OH DNA ends (which are generated during apoptosis) with biotinylated nucleotides. The biotinylated nucleotides are then detected by immunoperoxidase staining. Another apoptosis assay that may be 5 used to assess TGN-associated protein activity is the caspase assay, in which caspase activity is measured using a blue fluorescent substrate. Cleavage of the substrate by caspase 3 releases the fluorochrome, which then fluoresces green. An assay that may be employed to monitor cell proliferation associated with a TGN-associated protein is the MTT cell proliferation assay. The MTT cell proliferation assay is a 10 colorimetric assay which measures the reduction of a tetrazolium component (MTT) into an insoluble formazan product by the mitochondria of viable cells. After incubation of the cells with the MTT reagent, a detergent solution is added to lyse the cells and solubilize the colored crystals. The samples may be read using an ELISA plate reader. The amount of color produced is directly proportional to the 15 number of viable cells.

In certain embodiments, POSH or POSH-AP activities may include, without limitation, complex formation, ubiquitination and membrane fusion events (e.g. release of viral buds or fusion of vesicles). POSH-AP activity may be assessed by the presence of phosphorylated substrate, such as, in the case of PKA, phosphorylated POSH. The interaction of POSH with a small GTPase such as Rac 20 may also be indicative of the absence of phosphorylation of POSH by PKA. POSH complex formation may be assessed by immunoprecipitation and analysis of co-immunoprecipitated proteins or affinity purification and analysis of co-purified proteins. Fluorescence Resonance Energy Transfer (FRET)-based assays or other 25 energy transfer assays may also be used to determine complex formation.

The effect of an agent that modulates the activity of POSH or a POSH-AP may be evaluated for effects on the trafficking of a protein through the secretory system. For example, the effects of the agent on the trafficking of the protein may be assessed by detecting the glycosylation of the protein in the presence and absence 30 of the agent, for instance, through the use of antibodies specific for sugar moieties. For example, cell lysates from cells treated in the absence and presence of an agent that modulates the activity of POSH or a POSH-AP may be subjected to

immunoprecipitation and immunoblotting with antibodies directed to the glycoprotein of interest and the glycosylation state of the protein then compared.

Additional bioassays for assessing POSH and POSH-AP activities may include assays to detect the improper processing of a protein that is associated with a neurological disorder. One assay that may be used is an assay to detect the presence, including an increase or a decrease in the amount, of a protein associated with a neurological disorder. For example, the use of RNAi may be employed to knockdown the expression of a POSH or POSH-AP in cells (e.g., CHO cells or COS cells). The production of a secreted protein such as for example, amyloid beta, in the cell culture media, can then be assessed and compared to production of the secreted protein from control cells, which may be cells in which the POSH or POSH-AP activity has not been inhibited. The production of secreted proteins may be assessed, such as amyloid beta protein, which is associated with Alzheimer's disease. In some instances, a label may be incorporated into a secreted protein and the presence of the labeled secreted protein detected in the cell culture media. Proteins secreted from any cell type may be assessed, including for example, neural cells.

The effect of an agent that modulates the activity of POSH or a POSH-AP may be evaluated for effects on mouse models of various neurological disorders. For example, mouse models of Alzheimer's disease have been described. See, for example, United States Patent No. 5,612,486 for "Transgenic Animals Harboring APP Allele Having Swedish Mutation," Patent No. 5,850,003 (the '003 patent) for "Transgenic Rodents Harboring APP Allele Having Swedish Mutation," and United States Patent No. 5,455,169 entitled "Nucleic Acids for Diagnosing and Modeling Alzheimer's Disease". Mouse models of Alzheimer's disease tend to produce elevated levels of beta-amyloid protein in the brain, and the increase or decrease of such protein in response to treatment with a test agent may be detected. In some instances, it may also be desirable to assess the effects of a test agent on cognitive or behavioral characteristics of a mouse model for Alzheimer's disease, as well as mouse models for other neurological disorders.

In a further embodiment, transcript levels may be measured in cells having higher or lower levels of POSH or POSH-AP activity in order to identify genes that

are regulated by POSH or POSH-APs. Promoter regions for such genes (or larger portions of such genes) may be operatively linked to a reporter gene and used in a reporter gene-based assay to detect agents that enhance or diminish POSH- or POSH-AP-regulated gene expression. Transcript levels may be determined in any way known in the art, such as, for example, Northern blotting, RT-PCR, microarray, etc. Increased POSH activity may be achieved, for example, by introducing a strong POSH expression vector. Decreased POSH activity may be achieved, for example, by RNAi, antisense, ribozyme, gene knockout, etc.

In general, where the screening assay is a binding assay (whether protein-protein binding, agent-protein binding, etc.), one or more of the molecules may be joined to a label, where the label can directly or indirectly provide a detectable signal. Various labels include radioisotopes, fluorescers, chemiluminescers, enzymes, specific binding molecules, particles, e.g., magnetic particles, and the like. Specific binding molecules include pairs, such as biotin and streptavidin, digoxin and antidigoxin etc. For the specific binding members, the complementary member would normally be labeled with a molecule that provides for detection, in accordance with known procedures.

In further embodiments, the application provides methods for identifying targets for therapeutic intervention. A polypeptide that interacts with POSH or participates in a POSH-mediated process (such as viral maturation) may be used to identify candidate therapeutics. Such targets may be identified by identifying proteins that associated with POSH (POSH-APs) by, for example, immunoprecipitation with an anti-POSH antibody, in silico analysis of high-throughput binding data, two-hybrid screens, and other protein-protein interaction assays described herein or otherwise known in the art in view of this disclosure. Agents that bind to such targets or disrupt protein-protein interactions thereof, or inhibit a biochemical activity thereof may be used in such an assay. Targets that have been identified by such approaches include POSH-APs provided in Tables 7 and 8 and in Figure 36.

A variety of other reagents may be included in the screening assay. These include reagents like salts, neutral proteins, e.g., albumin, detergents, etc that are used to facilitate optimal protein-protein binding and/or reduce nonspecific or

background interactions. Reagents that improve the efficiency of the assay, such as protease inhibitors, nuclease inhibitors, anti- microbial agents, etc. may be used. The mixture of components are added in any order that provides for the requisite binding. Incubations are performed at any suitable temperature, typically between 4 °C and 40 °C. Incubation periods are selected for optimum activity, but may also be optimized to facilitate rapid high-throughput screening.

In certain embodiments, a test agent may be assessed for antiviral or anticancer activity by assessing effects on an activity (function) of a POSH-AP. Activity (function) may be affected by an agent that acts at one or more of the transcriptional, translational or post-translational stages. For example, an siRNA directed to a POSH-AP encoding gene will decrease activity, as will a small molecule that interferes with a catalytic activity of a POSH-AP. In certain embodiments, the agent inhibits the activity of one or more polypeptides selected from among HERPUD1 and MSTP028.

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7. Exemplary Nucleic Acids and Expression Vectors

In certain aspects, the application relates to nucleic acids encoding POSH polypeptides, such as, for example, SEQ ID Nos: 2, 5, 7, 9, 11, 26, 27, 28, 29 and 30. Nucleic acids of the application are further understood to include nucleic acids that comprise variants of SEQ ID Nos:1, 3, 4, 6, 8, 10, 31, 32, 33, 34, and 35. Variant nucleotide sequences include sequences that differ by one or more nucleotide substitutions, additions or deletions, such as allelic variants; and will, therefore, include coding sequences that differ from the nucleotide sequence of the coding sequence designated in SEQ ID Nos:1, 3, 4, 6, 8 10, 31, 32, 33, 34, and 35, e.g., due to the degeneracy of the genetic code. In other embodiments, variants will also include sequences that will hybridize under highly stringent conditions to a nucleotide sequence of a coding sequence designated in any of SEQ ID Nos:1, 3, 4, 6, 8 10, 31, 32, 33, 34, and 35. Preferred nucleic acids of the application are human POSH sequences, including, for example, any of SEQ ID Nos: 1, 3, 4, 6, 31, 32, 33, 34, 35 and variants thereof and nucleic acids encoding an amino acid sequence selected from among SEQ ID Nos: 2, 5, 7, 26, 27, 28, 29 and 30.

In certain aspects, the application relates to nucleic acids encoding POSH-AP polypeptides. For example, POSH-APs of the disclosure are listed in Table 7. Nucleic acid sequences encoding these POSH-APs are provided in Figure 36. Additional examples of POSH-APs of the disclosure are provided in Table 8. In 5 certain embodiments, variants will also include nucleic acid sequences that will hybridize under highly stringent conditions to a nucleotide sequence of a coding sequence of a POSH-AP. Preferred nucleic acids of the application are human POSH-AP sequences and variants thereof.

One of ordinary skill in the art will understand readily that appropriate 10 stringency conditions which promote DNA hybridization can be varied. For example, one could perform the hybridization at 6.0 x sodium chloride/sodium citrate (SSC) at about 45 °C, followed by a wash of 2.0 x SSC at 50 °C. For example, the salt concentration in the wash step can be selected from a low stringency of about 2.0 x SSC at 50 °C to a high stringency of about 0.2 x SSC at 50 15 °C. In addition, the temperature in the wash step can be increased from low stringency conditions at room temperature, about 22 °C, to high stringency conditions at about 65 °C. Both temperature and salt may be varied, or temperature or salt concentration may be held constant while the other variable is changed. In one embodiment, the application provides nucleic acids which hybridize under low 20 stringency conditions of 6 x SSC at room temperature followed by a wash at 2 x SSC at room temperature.

Isolated nucleic acids which differ from the POSH nucleic acid sequences or from the POSH-AP nucleic acid sequences due to degeneracy in the genetic code are also within the scope of the application. For example, a number of amino acids are 25 designated by more than one triplet. Codons that specify the same amino acid, or synonyms (for example, CAU and CAC are synonyms for histidine) may result in "silent" mutations which do not affect the amino acid sequence of the protein. However, it is expected that DNA sequence polymorphisms that do lead to changes in the amino acid sequences of the subject proteins will exist among mammalian 30 cells. One skilled in the art will appreciate that these variations in one or more nucleotides (up to about 3-5% of the nucleotides) of the nucleic acids encoding a particular protein may exist among individuals of a given species due to natural

allelic variation. Any and all such nucleotide variations and resulting amino acid polymorphisms are within the scope of this application.

Optionally, a POSH or a POSH-AP nucleic acid of the application will genetically complement a partial or complete loss of function phenotype in a cell.

5 For example, a POSH nucleic acid of the application may be expressed in a cell in which endogenous POSH has been reduced by RNAi, and the introduced POSH nucleic acid will mitigate a phenotype resulting from the RNAi. An exemplary POSH loss of function phenotype is a decrease in virus-like particle production in a cell transfected with a viral vector, optionally an HIV vector.

10 Another aspect of the application relates to POSH and POSH-AP nucleic acids that are used for antisense, RNAi or ribozymes. As used herein, nucleic acid therapy refers to administration or *in situ* generation of a nucleic acid or a derivative thereof which specifically hybridizes (e.g., binds) under cellular conditions with the cellular mRNA and/or genomic DNA encoding one of the POSH or POSH-AP polypeptides so as to inhibit production of that protein, e.g., by inhibiting transcription and/or translation. The binding may be by conventional base pair complementarity, or, for example, in the case of binding to DNA duplexes, through specific interactions in the major groove of the double helix.

15 A nucleic acid therapy construct of the present application can be delivered, for example, as an expression plasmid which, when transcribed in the cell, produces RNA which is complementary to at least a unique portion of the cellular mRNA which encodes a POSH or POSH-AP polypeptide. Alternatively, the construct is an oligonucleotide which is generated *ex vivo* and which, when introduced into the cell causes inhibition of expression by hybridizing with the mRNA and/or genomic sequences encoding a POSH or POSH-AP polypeptide. Such oligonucleotide probes are optionally modified oligonucleotide which are resistant to endogenous nucleases, e.g., exonucleases and/or endonucleases, and is therefore stable *in vivo*. Exemplary nucleic acid molecules for use as antisense oligonucleotides are phosphoramidate, phosphothioate and methylphosphonate analogs of DNA (see also 20 U.S. Patents 5,176,996; 5,264,564; and 5,256,775). Additionally, general approaches to constructing oligomers useful in nucleic acid therapy have been 25 30

reviewed, for example, by van der Krol et al., (1988) *Biotechniques* 6:958-976; and Stein et al., (1988) *Cancer Res* 48:2659-2668.

Accordingly, the modified oligomers of the application are useful in therapeutic, diagnostic, and research contexts. In therapeutic applications, the 5 oligomers are utilized in a manner appropriate for nucleic acid therapy in general.

In another aspect of the application, the subject nucleic acid is provided in an expression vector comprising a nucleotide sequence encoding a POSH or POSH-AP polypeptide and operably linked to at least one regulatory sequence. Regulatory sequences are art-recognized and are selected to direct expression of the POSH or 10 POSH-AP polypeptide. Accordingly, the term regulatory sequence includes promoters, enhancers and other expression control elements. Exemplary regulatory sequences are described in Goeddel; *Gene Expression Technology: Methods in Enzymology*, Academic Press, San Diego, CA (1990). For instance, any of a wide variety of expression control sequences that control the expression of a DNA 15 sequence when operatively linked to it may be used in these vectors to express DNA sequences encoding a POSH or POSH-AP polypeptide. Such useful expression control sequences, include, for example, the early and late promoters of SV40, tet promoter, adenovirus or cytomegalovirus immediate early promoter, the lac system, the trp system, the TAC or TRC system, T7 promoter whose expression is directed 20 by T7 RNA polymerase, the major operator and promoter regions of phage lambda, the control regions for fd coat protein, the promoter for 3-phosphoglycerate kinase or other glycolytic enzymes, the promoters of acid phosphatase, e.g., Pho5, the promoters of the yeast  $\alpha$ -mating factors, the polyhedron promoter of the baculovirus system and other sequences known to control the expression of genes of prokaryotic 25 or eukaryotic cells or their viruses, and various combinations thereof. It should be understood that the design of the expression vector may depend on such factors as the choice of the host cell to be transformed and/or the type of protein desired to be expressed. Moreover, the vector's copy number, the ability to control that copy number and the expression of any other protein encoded by the vector, such as 30 antibiotic markers, should also be considered.

As will be apparent, the subject gene constructs can be used to cause expression of the POSH or POSH-AP polypeptides in cells propagated in culture,

e.g., to produce proteins or polypeptides, including fusion proteins or polypeptides, for purification.

This application also pertains to a host cell transfected with a recombinant gene including a coding sequence for one or more of the POSH or POSH-AP polypeptides. The host cell may be any prokaryotic or eukaryotic cell. For example, a polypeptide of the present application may be expressed in bacterial cells such as *E. coli*, insect cells (e.g., using a baculovirus expression system), yeast, or mammalian cells. Other suitable host cells are known to those skilled in the art. Accordingly, the present application further pertains to methods of producing the POSH or POSH-AP polypeptides. For example, a host cell transfected with an expression vector encoding a POSH polypeptide can be cultured under appropriate conditions to allow expression of the polypeptide to occur. The polypeptide may be secreted and isolated from a mixture of cells and medium containing the polypeptide. Alternatively, the polypeptide may be retained cytoplasmically and the cells harvested, lysed and the protein isolated. A cell culture includes host cells, media and other byproducts. Suitable media for cell culture are well known in the art. The polypeptide can be isolated from cell culture medium, host cells, or both using techniques known in the art for purifying proteins, including ion-exchange chromatography, gel filtration chromatography, ultrafiltration, electrophoresis, and immunoaffinity purification with antibodies specific for particular epitopes of the polypeptide. In a preferred embodiment, the POSH or POSH-AP polypeptide is a fusion protein containing a domain which facilitates its purification, such as a POSH-GST fusion protein, POSH-intein fusion protein, POSH-cellulose binding domain fusion protein, POSH-polyhistidine fusion protein etc.

A recombinant POSH or POSH-AP nucleic acid can be produced by ligating the cloned gene, or a portion thereof, into a vector suitable for expression in either prokaryotic cells, eukaryotic cells, or both. Expression vehicles for production of a recombinant POSH or POSH-AP polypeptides include plasmids and other vectors. For instance, suitable vectors for the expression of a POSH polypeptide include plasmids of the types: pBR322-derived plasmids, pEMBL-derived plasmids, pEX-derived plasmids, pBTac-derived plasmids and pUC-derived plasmids for expression in prokaryotic cells, such as *E. coli*.

The preferred mammalian expression vectors contain both prokaryotic sequences to facilitate the propagation of the vector in bacteria, and one or more eukaryotic transcription units that are expressed in eukaryotic cells. The pcDNAI/amp, pcDNAI/neo, pRc/CMV, pSV2gpt, pSV2neo, pSV2-dhfr, pTk2, 5 pRSVneo, pMSG, pSVT7, pko-neo and pHg derived vectors are examples of mammalian expression vectors suitable for transfection of eukaryotic cells. Some of these vectors are modified with sequences from bacterial plasmids, such as pBR322, to facilitate replication and drug resistance selection in both prokaryotic and eukaryotic cells. Alternatively, derivatives of viruses such as the bovine papilloma 10 virus (BPV-1), or Epstein-Barr virus (pHEBo, pREP-derived and p205) can be used for transient expression of proteins in eukaryotic cells. Examples of other viral (including retroviral) expression systems can be found below in the description of gene therapy delivery systems. The various methods employed in the preparation of the plasmids and transformation of host organisms are well known in the art. For 15 other suitable expression systems for both prokaryotic and eukaryotic cells, as well as general recombinant procedures, see *Molecular Cloning A Laboratory Manual*, 2nd Ed., ed. by Sambrook, Fritsch and Maniatis (Cold Spring Harbor Laboratory Press, 1989) Chapters 16 and 17. In some instances, it may be desirable to express the recombinant POSH or POSH-AP polypeptide by the use of a baculovirus 20 expression system. Examples of such baculovirus expression systems include pVL-derived vectors (such as pVL1392, pVL1393 and pVL941), pAcUW-derived vectors (such as pAcUW1), and pBlueBac-derived vectors (such as the β-gal containing pBlueBac III).

Alternatively, the coding sequences for the polypeptide can be incorporated 25 as a part of a fusion gene including a nucleotide sequence encoding a different polypeptide. This type of expression system can be useful under conditions where it is desirable, e.g., to produce an immunogenic fragment of a POSH or POSH-AP polypeptide. For example, the VP6 capsid protein of rotavirus can be used as an immunologic carrier protein for portions of polypeptide, either in the monomeric 30 form or in the form of a viral particle. The nucleic acid sequences corresponding to the portion of the POSH or POSH-AP polypeptide to which antibodies are to be raised can be incorporated into a fusion gene construct which includes coding

sequences for a late vaccinia virus structural protein to produce a set of recombinant viruses expressing fusion proteins comprising a portion of the protein as part of the virion. The Hepatitis B surface antigen can also be utilized in this role as well. Similarly, chimeric constructs coding for fusion proteins containing a portion of a 5 POSH polypeptide and the poliovirus capsid protein can be created to enhance immunogenicity (see, for example, EP Publication NO: 0259149; and Evans et al., (1989) *Nature* 339:385; Huang et al., (1988) *J. Virol.* 62:3855; and Schlienger et al., (1992) *J. Virol.* 66:2).

The Multiple Antigen Peptide system for peptide-based immunization can be 10 utilized, wherein a desired portion of a POSH or POSH-AP polypeptide is obtained directly from organo-chemical synthesis of the peptide onto an oligomeric branching lysine core (see, for example, Posnett et al., (1988) *JBC* 263:1719 and Nardelli et al., (1992) *J. Immunol.* 148:914). Antigenic determinants of a POSH or POSH-AP polypeptide can also be expressed and presented by bacterial cells.

In another embodiment, a fusion gene coding for a purification leader sequence, such as a poly-(His)/enterokinase cleavage site sequence at the N-terminus of the desired portion of the recombinant protein, can allow purification of 15 the expressed fusion protein by affinity chromatography using a Ni<sup>2+</sup> metal resin. The purification leader sequence can then be subsequently removed by treatment 20 with enterokinase to provide the purified POSH or POSH-AP polypeptide (e.g., see Hochuli et al., (1987) *J. Chromatography* 411:177; and Janknecht et al., *PNAS USA* 88:8972).

Techniques for making fusion genes are well known. Essentially, the joining 25 of various DNA fragments coding for different polypeptide sequences is performed in accordance with conventional techniques, employing blunt-ended or stagger-ended termini for ligation, restriction enzyme digestion to provide for appropriate termini, filling-in of cohesive ends as appropriate, alkaline phosphatase treatment to avoid undesirable joining, and enzymatic ligation. In another embodiment, the fusion gene can be synthesized by conventional techniques including automated 30 DNA synthesizers. Alternatively, PCR amplification of gene fragments can be carried out using anchor primers which give rise to complementary overhangs between two consecutive gene fragments which can subsequently be annealed to

generate a chimeric gene sequence (see, for example, *Current Protocols in Molecular Biology*, eds. Ausubel et al., John Wiley & Sons: 1992).

Table 2: Exemplary POSH nucleic acids

<u>Sequence Name</u>	<u>Organism</u>	<u>Accession Number</u>
cDNA FLJ11367 fis, clone HEMBA1000303	Homo sapiens	AK021429
Plenty of SH3 domains (POSH) mRNA	Mus musculus	NM_021506
Plenty of SH3s (POSH) mRNA	Mus musculus	AF030131
Plenty of SH3s (POSH) mRNA	Drosophila melanogaster	NM_079052
Plenty of SH3s (POSH) mRNA	Drosophila melanogaster	AF220364

5

Table 3: Exemplary POSH polypeptides

<u>Sequence Name</u>	<u>Organism</u>	<u>Accession Number</u>
SH3 domains-containing protein POSH	Mus musculus	T09071
plenty of SH3 domains	Mus musculus	NP_067481
Plenty of SH3s; POSH	Mus musculus	AAC40070
Plenty of SH3s	Drosophila melanogaster	AAF37265
LD45365p	Drosophila melanogaster	AAK93408
POSH gene product	Drosophila melanogaster	AAF57833

Plenty of SH3s	Drosophila melanogaster	NP_523776
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In addition the following Tables provide the nucleic acid sequence and related SEQ ID NOs for domains of human POSH protein and a summary of POSH sequence identification numbers used in this application.

5

Table 4. Nucleic Acid Sequences and related SEQ ID NOs for domains in human POSH

Name of the sequence	Sequence	SEQ ID NO.
RING domain	TGTCCGGTGTCTAGAGCGCTTGATGCTTCTGCGAAGGTCT TGCCTTGCCAGCATACTGTTTGCAAGCGATGTTGCT GGGGATCGTAGGTTCTCGAAATGAACCTCAGATGTCCCGAGT	31
1 <sup>st</sup> SH <sub>3</sub> domain	CCATGTGCCAAGCGTTATACAACATGAAGGAAAAGAGCCTG GAGACCTTAATTTCAGCAAAGGCGACATCATCATTT GCGAAGACAAGTGGATGAAAATTGGTACCATGGGAAGTCAAT GGAATCCATGGCTTTCCCCACCAACTTGTGCAGA TTATT	32
2 <sup>nd</sup> SH <sub>3</sub> domain	CCTCAGTGCCTAAAGCACTTTATGACTTGAAGTGAAGACAAGG AAGCAGACAAAGATTGCCTTCCATTGCAAAGGATGA TGTTCTGACTGTGATCCGAAGAGTGGATGAAAATGGCTGAA GGAATGCTGGCAGACAAAATAGGAATATTCACATT CATATGTTGAGTTAAC	33
3 <sup>rd</sup> SH <sub>3</sub> domain	AGTGTGTATGTTGCTATATATCCATACACTCCTCGAAAGAGG ATGAACCTAGAGCTGAGAAAAGGGGAGATGTTTAGT GTTTGAGCGCTGCCAGGATGGCTGGTTCAAAGGGACATCCATG CATACCAGCAAGATAGGGTTTCCCTGGCAATTATG TGGCACCCAGTC	34

4 <sup>th</sup> SH <sub>3</sub> domain	GAAAGGCACAGGGTGGTGGTTCCCTATCCTCCTCAGAGTGAGG CAGAACTTGAACCTAAAGAAGGAGATATTGTGTTGT TCATAAAAAACGAGAGGATGGCTGGTTCAAAGGCACATTACAA CGTAATGGGAAAATGGCCTTTCCCAGGAAGCTTG TGGAAAACA	35
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Table 5. Summary of POSH sequence Identification Numbers

Sequence Information	Sequence Identification Number (SEQ ID NO)
Human POSH Coding Sequence	SEQ ID No: 1
Human POSH Amino Acid Sequence	SEQ ID No: 2
Human POSH cDNA Sequence	SEQ ID No: 3
5' cDNA Fragment of Human POSH	SEQ ID No: 4
N-terminus Protein Fragment of Human POSH	SEQ ID No: 5
3' mRNA Fragment of Human POSH	SEQ ID No: 6
C-terminus Protein Fragment of Human POSH	SEQ ID No: 7
Mouse POSH mRNA Sequence	SEQ ID No: 8
Mouse POSH Protein Sequence	SEQ ID No: 9
Drosophila melanogaster POSH mRNA Sequence	SEQ ID No: 10
Drosophila melanogaster POSH Protein Sequence	SEQ ID No: 11
Human POSH RING Domain Amino Acid Sequence	SEQ ID No: 26
Human POSH 1 <sup>st</sup> SH <sub>3</sub> Domain Amino Acid Sequence	SEQ ID No: 27
Human POSH 2 <sup>nd</sup> SH <sub>3</sub> Domain Amino Acid Sequence	SEQ ID No: 28
Human POSH 3 <sup>rd</sup> SH <sub>3</sub> Domain Amino Acid Sequence	SEQ ID No: 29
Human POSH 4 <sup>th</sup> SH <sub>3</sub> Domain Amino Acid Sequence	SEQ ID No: 30
Human POSH RING Domain Nucleic Acid Sequence	SEQ ID No: 31

Human POSH 1 <sup>st</sup> SH <sub>3</sub> Domain Nucleic Acid Sequence	SEQ ID No: 32
Human POSH 2 <sup>nd</sup> SH <sub>3</sub> Domain Nucleic Acid Sequence	SEQ ID No: 33
Human POSH 3 <sup>rd</sup> SH <sub>3</sub> Domain Nucleic Acid Sequence	SEQ ID No: 34
Human POSH 4 <sup>th</sup> SH <sub>3</sub> Domain Nucleic Acid Sequence	SEQ ID No: 35

#### 8. Exemplary Polypeptides

In certain aspects, the present application relates to POSH polypeptides, which are isolated from, or otherwise substantially free of, other intracellular proteins which might normally be associated with the protein or a particular complex including the protein. In certain embodiments, POSH polypeptides have an amino acid sequence that is at least 60% identical to an amino acid sequence as set forth in any of SEQ ID Nos: 2, 5, 7, 9, 11, 26, 27, 28, 29 and 30. In other embodiments, the polypeptide has an amino acid sequence at least 65%, 70%, 75%, 80%, 85%, 90%, 95%, 97%, 98%, 99% or 100% identical to an amino acid sequence as set forth in any of SEQ ID Nos: 2, 5, 7, 9, 11, 26, 27, 28, 29 and 30.

In certain aspects, the application also relates to POSH-AP polypeptides (e.g., a POSH-AP provided in Table 7). Amino acid sequences of the POSH-APs listed in Table 7 are provided in Figure 36. Additional POSH-AP polypeptides are provided in Table 8. In certain embodiments, POSH-AP polypeptides have an amino acid sequence that is at least 60% identical to an amino acid sequence as set forth in Figure 36. In other embodiments, the POSH-AP polypeptide has an amino acid sequence at least 65%, 70%, 75%, 80%, 85%, 90%, 95%, 97%, 98%, 99% or 100% identical to an amino acid sequence as set forth in Figure 36.

Optionally, a POSH or POSH-AP polypeptide of the application will function in place of an endogenous POSH or POSH-AP polypeptide, for example by mitigating a partial or complete loss of function phenotype in a cell. For example, a POSH polypeptide of the application may be produced in a cell in which endogenous POSH has been reduced by RNAi, and the introduced POSH polypeptide will mitigate a phenotype resulting from the RNAi. An exemplary

POSH loss of function phenotype is a decrease in virus-like particle production in a cell transfected with a viral vector, optionally an HIV vector. In certain embodiments, a POSH polypeptide, when produced at an effective level in a cell, induces apoptosis.

- 5       In another aspect, the application provides polypeptides that are agonists or antagonists of a POSH or POSH-AP polypeptide. Variants and fragments of a POSH or POSH-AP polypeptide may have a hyperactive or constitutive activity, or, alternatively, act to prevent POSH or POSH-AP polypeptides from performing one or more functions. For example, a truncated form lacking one or more domain may
- 10      have a dominant negative effect.

- Another aspect of the application relates to polypeptides derived from a full-length POSH or POSH-AP polypeptide. Isolated peptidyl portions of the subject proteins can be obtained by screening polypeptides recombinantly produced from the corresponding fragment of the nucleic acid encoding such polypeptides. In addition, fragments can be chemically synthesized using techniques known in the art such as conventional Merrifield solid phase f-Moc or t-Boc chemistry. For example, any one of the subject proteins can be arbitrarily divided into fragments of desired length with no overlap of the fragments, or preferably divided into overlapping fragments of a desired length. The fragments can be produced (recombinantly or by chemical synthesis) and tested to identify those peptidyl fragments which can function as either agonists or antagonists of the formation of a specific protein complex, or more generally of a POSH:POSH-AP complex, such as by microinjection assays.

- It is also possible to modify the structure of the POSH or POSH-AP polypeptides for such purposes as enhancing therapeutic or prophylactic efficacy, or stability (e.g., ex vivo shelf life and resistance to proteolytic degradation in vivo). Such modified polypeptides, when designed to retain at least one activity of the naturally-occurring form of the protein, are considered functional equivalents of the POSH or POSH-AP polypeptides described in more detail herein. Such modified polypeptides can be produced, for instance, by amino acid substitution, deletion, or addition.

For instance, it is reasonable to expect, for example, that an isolated replacement of a leucine with an isoleucine or valine, an aspartate with a glutamate, a threonine with a serine, or a similar replacement of an amino acid with a structurally related amino acid (i.e., conservative mutations) will not have a major effect on the biological activity of the resulting molecule. Conservative replacements are those that take place within a family of amino acids that are related in their side chains. Genetically encoded amino acids can be divided into four families (see, for example, Biochemistry, 2nd ed., Ed. by L. Stryer, W.H. Freeman and Co., 1981). Whether a change in the amino acid sequence of a polypeptide results in a functional homolog can be readily determined by assessing the ability of the variant polypeptide to produce a response in cells in a fashion similar to the wild-type protein. For instance, such variant forms of a POSH polypeptide can be assessed, e.g., for their ability to bind to another polypeptide, e.g., another POSH polypeptide or another protein involved in viral maturation. Polypeptides in which more than one replacement has taken place can readily be tested in the same manner.

This application further contemplates a method of generating sets of combinatorial mutants of the POSH or POSH-AP polypeptides, as well as truncation mutants, and is especially useful for identifying potential variant sequences (e.g., homologs) that are functional in binding to a POSH or POSH-AP polypeptide. The purpose of screening such combinatorial libraries is to generate, for example, POSH homologs which can act as either agonists or antagonist, or alternatively, which possess novel activities all together. Combinatorially-derived homologs can be generated which have a selective potency relative to a naturally occurring POSH or POSH-AP polypeptide. Such proteins, when expressed from recombinant DNA constructs, can be used in gene therapy protocols.

Likewise, mutagenesis can give rise to homologs which have intracellular half-lives dramatically different than the corresponding wild-type protein. For example, the altered protein can be rendered either more stable or less stable to proteolytic degradation or other cellular process which result in destruction of, or otherwise inactivation of the POSH or POSH-AP polypeptide of interest. Such homologs, and the genes which encode them, can be utilized to alter POSH or POSH-AP levels by modulating the half-life of the protein. For instance, a short

half-life can give rise to more transient biological effects and, when part of an inducible expression system, can allow tighter control of recombinant POSH or POSH-AP levels within the cell. As above, such proteins, and particularly their recombinant nucleic acid constructs, can be used in gene therapy protocols.

5 In similar fashion, POSH or POSH-AP homologs can be generated by the present combinatorial approach to act as antagonists, in that they are able to interfere with the ability of the corresponding wild-type protein to function.

In a representative embodiment of this method, the amino acid sequences for a population of POSH or POSH-AP homologs are aligned, preferably to promote the 10 highest homology possible. Such a population of variants can include, for example, homologs from one or more species, or homologs from the same species but which differ due to mutation. Amino acids which appear at each position of the aligned sequences are selected to create a degenerate set of combinatorial sequences. In a preferred embodiment, the combinatorial library is produced by way of a degenerate 15 library of genes encoding a library of polypeptides which each include at least a portion of potential POSH or POSH-AP sequences. For instance, a mixture of synthetic oligonucleotides can be enzymatically ligated into gene sequences such that the degenerate set of potential POSH or POSH-AP nucleotide sequences are expressible as individual polypeptides, or alternatively, as a set of larger fusion 20 proteins (e.g., for phage display).

There are many ways by which the library of potential homologs can be generated from a degenerate oligonucleotide sequence. Chemical synthesis of a degenerate gene sequence can be carried out in an automatic DNA synthesizer, and the synthetic genes then be ligated into an appropriate gene for expression. The 25 purpose of a degenerate set of genes is to provide, in one mixture, all of the sequences encoding the desired set of potential POSH or POSH-AP sequences. The synthesis of degenerate oligonucleotides is well known in the art (see for example, Narang, SA (1983) Tetrahedron 39:3; Itakura et al., (1981) Recombinant DNA, Proc. 3rd Cleveland Sympos. Macromolecules, ed. AG Walton, Amsterdam: Elsevier pp273-289; Itakura et al., (1984) Annu. Rev. Biochem. 53:323; Itakura et al., (1984) Science 198:1056; Ike et al., (1983) Nucleic Acid Res. 11:477). Such 30 techniques have been employed in the directed evolution of other proteins (see, for

example, Scott et al., (1990) Science 249:386-390; Roberts et al., (1992) PNAS USA 89:2429-2433; Devlin et al., (1990) Science 249: 404-406; Cwirla et al., (1990) PNAS USA 87: 6378-6382; as well as U.S. Patent Nos: 5,223,409, 5,198,346, and 5,096,815).

5 Alternatively, other forms of mutagenesis can be utilized to generate a combinatorial library. For example, POSH or POSH-AP homologs (both agonist and antagonist forms) can be generated and isolated from a library by screening using, for example, alanine scanning mutagenesis and the like (Ruf et al., (1994) Biochemistry 33:1565-1572; Wang et al., (1994) J. Biol. Chem. 269:3095-3099; 10 Balint et al., (1993) Gene 137:109-118; Grodberg et al., (1993) Eur. J. Biochem. 218:597-601; Nagashima et al., (1993) J. Biol. Chem. 268:2888-2892; Lowman et al., (1991) Biochemistry 30:10832-10838; and Cunningham et al., (1989) Science 244:1081-1085), by linker scanning mutagenesis (Gustin et al., (1993) Virology 193:653-660; Brown et al., (1992) Mol. Cell Biol. 12:2644-2652; McKnight et al., 15 (1982) Science 232:316); by saturation mutagenesis (Meyers et al., (1986) Science 232:613); by PCR mutagenesis (Leung et al., (1989) Method Cell Mol Biol 1:11-19); or by random mutagenesis, including chemical mutagenesis, etc. (Miller et al., (1992) A Short Course in Bacterial Genetics, CSHL Press, Cold Spring Harbor, NY; and Greener et al., (1994) Strategies in Mol Biol 7:32-34). Linker scanning 20 mutagenesis, particularly in a combinatorial setting, is an attractive method for identifying truncated (bioactive) forms of POSH or POSH-AP polypeptides.

A wide range of techniques are known in the art for screening gene products of combinatorial libraries made by point mutations and truncations, and, for that matter, for screening cDNA libraries for gene products having a certain property. 25 Such techniques will be generally adaptable for rapid screening of the gene libraries generated by the combinatorial mutagenesis of POSH or POSH-AP homologs. The most widely used techniques for screening large gene libraries typically comprises cloning the gene library into replicable expression vectors, transforming appropriate cells with the resulting library of vectors, and expressing the combinatorial genes 30 under conditions in which detection of a desired activity facilitates relatively easy isolation of the vector encoding the gene whose product was detected. Each of the illustrative assays described below are amenable to high through-put analysis as

necessary to screen large numbers of degenerate sequences created by combinatorial mutagenesis techniques.

In an illustrative embodiment of a screening assay, candidate combinatorial gene products of one of the subject proteins are displayed on the surface of a cell or virus, and the ability of particular cells or viral particles to bind a POSH or POSH-AP polypeptide is detected in a "panning assay". For instance, a library of POSH variants can be cloned into the gene for a surface membrane protein of a bacterial cell (Ladner et al., WO 88/06630; Fuchs et al., (1991) Bio/Technology 9:1370-1371; and Goward et al., (1992) TIBS 18:136-140), and the resulting fusion protein detected by panning, e.g., using a fluorescently labeled molecule which binds the POSH polypeptide, to score for potentially functional homologs. Cells can be visually inspected and separated under a fluorescence microscope, or, where the morphology of the cell permits, separated by a fluorescence-activated cell sorter.

In similar fashion, the gene library can be expressed as a fusion protein on the surface of a viral particle. For instance, in the filamentous phage system, foreign peptide sequences can be expressed on the surface of infectious phage, thereby conferring two significant benefits. First, since these phage can be applied to affinity matrices at very high concentrations, a large number of phage can be screened at one time. Second, since each infectious phage displays the combinatorial gene product on its surface, if a particular phage is recovered from an affinity matrix in low yield, the phage can be amplified by another round of infection. The group of almost identical *E. coli* filamentous phages M13, fd, and f1 are most often used in phage display libraries, as either of the phage gIII or gVIII coat proteins can be used to generate fusion proteins without disrupting the ultimate packaging of the viral particle (Ladner et al., PCT publication WO 90/02909; Garrard et al., PCT publication WO 92/09690; Marks et al., (1992) J. Biol. Chem. 267:16007-16010; Griffiths et al., (1993) EMBO J. 12:725-734; Clackson et al., (1991) Nature 352:624-628; and Barbas et al., (1992) PNAS USA 89:4457-4461).

The application also provides for reduction of the POSH or POSH-AP polypeptides to generate mimetics, e.g., peptide or non-peptide agents, which are able to mimic binding of the authentic protein to another cellular partner. Such mutagenic techniques as described above, as well as the thioredoxin system, are also

particularly useful for mapping the determinants of a POSH or POSH-AP polypeptide which participate in protein-protein interactions involved in, for example, binding of proteins involved in viral maturation to each other. To illustrate, the critical residues of a POSH or POSH-AP polypeptide which are involved in molecular recognition of a substrate protein can be determined and used to generate its derivative peptidomimetics which bind to the substrate protein, and by inhibiting POSH or POSH-AP binding, act to inhibit its biological activity. By employing, for example, scanning mutagenesis to map the amino acid residues of a POSH polypeptide which are involved in binding to another polypeptide, peptidomimetic compounds can be generated which mimic those residues involved in binding. For instance, non-hydrolyzable peptide analogs of such residues can be generated using benzodiazepine (e.g., see Freidinger et al., in Peptides: Chemistry and Biology, G.R. Marshall ed., ESCOM Publisher: Leiden, Netherlands, 1988), azepine (e.g., see Huffman et al., in Peptides: Chemistry and Biology, G.R. Marshall ed., ESCOM Publisher: Leiden, Netherlands, 1988), substituted gamma lactam rings (Garvey et al., in Peptides: Chemistry and Biology, G.R. Marshall ed., ESCOM Publisher: Leiden, Netherlands, 1988), keto-methylene pseudopeptides (Ewenson et al., (1986) J. Med. Chem. 29:295; and Ewenson et al., in Peptides: Structure and Function (Proceedings of the 9th American Peptide Symposium) Pierce Chemical Co. Rockland, IL, 1985), b-turn dipeptide cores (Nagai et al., (1985) Tetrahedron Lett 26:647; and Sato et al., (1986) J Chem Soc Perkin Trans 1:1231), and b-aminoalcohols (Gordon et al., (1985) Biochem Biophys Res Commun 126:419; and Dann et al., (1986) Biochem Biophys Res Commun 134:71).

The following table provides the sequences of the RING domain and the various SH3 domains of POSH.

Table 6. Amino Acid Sequences and related SEQ ID NOS for domains in human POSH

Name of the sequence	Sequence	SEQ ID NO.
RING	CPVCLERLDASAKVLPQCQHTFCKRCLLGIVGSRNELRCPEC	26

9372369\_1

domain		
1 <sup>st</sup> SH <sub>3</sub> domain	PCA KAL YN YEG KEP GDL KFS KG DII IL RRQ VD EN WY HGE VNG I HGF FPT NFV QII K	27
2 <sup>nd</sup> SH <sub>3</sub> domain	PQ CKAL YD FEVK DKE ADK DCL PFA KDD VLTV IR RV D EN WA EGMLAD KIG IFPI SYVE FNS	28
3 <sup>rd</sup> SH <sub>3</sub> domain	SV YVAI YPY TPR KEDE LE LRKG EMFL VFER CQDG WF KG TS MHT SKI GV FP GNY VAP VT	29
4 <sup>th</sup> SH <sub>3</sub> domain	ER HRV VV SYP P QSE AE EL KEG DIV FV KKRE DG WF KG TL QR NGKT GL FP GS FVEN I	30

The following table provides a list of selected POSH-APs and their related SEQ ID NOs.

5 Table 7 – Selected POSH APs

Protein	Protein Sequence (SEQ ID NO:)	mRNA Sequence (SEQ ID NO:)
ARF1	223	325-339
ARF5	224	340-344
ATP6V0C	225-226	345-351
CBL-B	361; 398; 227-230	353-360
CENTB1	231-232	37-47
DDEF1	233-237	48-54
EIF3S3	238	55-57
EPS8L2	239	58-60
GOCAP1	240-243	61-68
GOSR2	244-248	69-76
HERPUD1	249-252	77-86
HLA-A	253	87-88
HLA-B	254	89
MSTP028	255-256	90-94
PACS-1	362-366	95-100
PPP1CA	261-263; 395	101-110
PRKAR1A	264-265	111-122; 396-397
PTPN12	266-268	123-129
RALA	269-270	130-134
SIAH1	271-272	135-141
SMN1	273-275	142-146
SMN2	276-280	147-151
SNX1	281-286	152-161
SNX3	287-290	162-174

Protein	Protein Sequence (SEQ ID NO:)	mRNA Sequence (SEQ ID NO:)
SRA1	291-294	175-182
SYNE1	295-307	183-201
TTC3	308-312	202-207
UBE2N	313	208-210
UNC84B	314	211-213
VCY2IP1	315-323	214-222
SPG20	386-388	367-374
WASF1	389	375-376
HIP55	390-394	377-385

Table 8 below provides a list of POSH-APs that bound POSH in a 2-hybrid assay. Nucleic acid and amino acid sequences of the POSH-APs listed in Table 8 were filed in a U.S. provisional application filed in the name of Daniel N. Taglicht, Iris Alroy, Yuval Reiss, Liora Yaar, Danny Ben-Avraham, Shmuel Tuvia, and Tsvika Greener entitled "Posh Interacting Proteins and Related Methods", filed on March 2, 2004 (Attorney Docket No. PROL-P79-024), which Provisional Application is incorporated herein by reference in its entirety.

Table 8 – POSH-APs

Protein and Variant	Protein Sequence (public gi No.)	mRNA Sequence (public gi No.)
BCL9 – var 1	4757846	4757845
BRD4 – var 1	19718731	19718730
BRD4 – var 2	7657218	7657217
DRP2 – var 1	4503393	4503392
MAP1A – var 1	21536458	21536457
SH2D2A – var 1	4503633	31543620
BAT3 – var 1	18375630	18375633
BAT3 – var 2	18375634	18375631
BAT3 – var 3	*	18375629
BCAR1 – var 1	7656924	7656923
DAP – var 1	4758120	4758119
EVPL – var 1	4503613	4503612
FLJ13231 – var 1	38604073	38604072
FL53657 – var 1	13376230	13376229
HSPC142 – var 1	7661802	7661801
LOC118987 – var 1	29789403	31341089
NAP4 – var 1	2443367	2443366

Protein and Variant	Protein Sequence (public gi No.)	mRNA Sequence (public gi No.)
RBAF600 - var 1	24416002	24416001
XTP3TPB - var 1	20070264	20070263
Hs.31535 - var 1	37546355	37546354
ASF1B - var 1	8922549	8922548
ATP5A1 - var 1	4757810	23346425
C6 or f1 - var 1	9954875	39725662
C6 or f60 - var 1	24431997	24431996
CDT1 - var 1	16418337	19923847
CIC - var 1	16507208	16507207
CLK2 - var 1	4557477	4557476
CLK2 - var 2	4502883	4502882
DNM2 - var 1	4826700	4826699
EEF1A1 - var 1	4503471	25453469
EIF4EBP1 - var 1	4758258	20070179
FLJ13479 - var 1	24432013	39725704
GC20 - var 1	5031711	5031710
GLUL - var 1	19923206	21361767
HEBP2 - var 1	7657603	7657602
ITGB- var 1	4504779	4504778
LAMA5 - var 1	21264602	21264601
LOC90987 - var 1	29734345	29734344
MRPL36 - var 1	23111040	20806105
Hs.380933 - var 1	30149441	37550602
NQO2 - var 1	4505417	4505416
PCBP1 - var 1	5453854	14141164
PCNT2 - var 1	22035674	35493922
PGD - var 1	984325	984324
RAP80 - var 1	21361593	21361592
RNH - var 1	21361547	21361546
RPL - var 1	4506597	15431291
RPS20 - var 1	4506697	14591915
RPS27A - var 1	4506713	27436941
SETDB1 - var 1	6912652	6912651
SF3A2 - var 1	21361376	32189413
UBB - var 1	11024714	22538474
ARHV - var 1	20070360	20070359
KIAA1111 - var 1	32698700	32698699
ZNF147 - var 1	4827065	15208652
PAWR - var 1	4505613	4505612
TPX2 - var 1	20127519	31542258
HSPA1B - var 1	4885431	26787974
DLG5 - var 1	3043690	3650451
DLG5 - var 2	28466997	28466996
DLG5 - var 3	3650452	16549841

Protein and Variant	Protein Sequence (public gi No.)	mRNA Sequence (public gi No.)
DLG5 - var 4	*	16807129
DLG5 - var 5	*	22539637
DLG5 - var 6	*	15929207
DLG5 - var 7	*	3043689
KIAA1598 - var 1	7023592	7023591
KIAA1598 - var 2	10047271	7018519
KIAA1598 - var 3	*	21314680
KIAA1598 - var 4	*	10047270
KIAA1598 - var 5	*	21755030
KIAA1598 - var 6	*	21755023
KIAA1598 - var 7	*	21754670
KIAA1598 - var 8	*	21750902
KIAA1598 - var 9	*	21749984
KIAA1598 - var 10	*	21749775
KIAA1598 - var 11	*	21749737
CGI-27 - var 1	7705720	23270696
CGI-27 - var 2	*	22902234
CGI-27 - var 3	*	17046302
CGI-27 - var 4	*	16553689
CGI-27 - var 5	*	10433504
CGI-27 - var 6	*	4680692
CGI-27 - var 7	*	20127543
BIA2 - var 1	5262640	5262639
BIA2 - var 2	21591225	21591224
BIA2 - var 3	*	21755615
COLIA1 - var 1	180392	407589
COLIA1 - var 2	180857	30015
COLIA1 - var 3	1418928	30092
COLIA1 - var 4	22328092	7209641
COLIA1 - var 5	762938	22328091
COLIA1 - var 6	30016	1418927
COLIA1 - var 7	407590	180856
COLIA1 - var 8	*	180391
COLIA1 - var 9	*	14719826
DKFZp761A052 - var 1	10434104	10434103
DKFZp761A052 - var 2	10439058	10439057
DKFZp761A052 - var 3	14602829	14602828
DKFZp761A052 - var 4	20380411	15079884
DKFZp761A052 - var 5	6808165	20380410
DKFZp761A052 - var 6	*	6808164
TLE1 - var 1	14603281	16041735
TLE1 - var 2	307510	14603280
TLE1 - var 3	*	307509
EGLN2 - var 1	8922130	23273571

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Protein and Variant	Protein Sequence (public gi No.)	mRNA Sequence (public gi No.)
EGLN2 – var 2	12804603	10437903
EGLN2 – var 3	14547148	21733075
EGLN2 – var 4	18031805	21758140
EGLN2 – var 5	*	18677002
EGLN2 – var 6	*	18031804
EGLN2 – var 7	*	18141576
EGLN2 – var 8	*	14547147
EGLN2 – var 9	*	12804602
EGLN2 – var 10	*	10439822
EGLN2 – var 11	*	8922129
STC2 – var 1	3335144	3335143
STC2 – var 2	*	3702223
STC2 – var 3	*	4050037
STC2 – var 4	*	4104014
STC2 – var 5	*	13623494
STC2 – var 6	*	14042507
STC2 – var 7	*	14042032
STC2 – var 8	*	21755241
STC2 – var 9	*	21755207
STC2 – var 10	*	22761473
STC2 – var 11	*	12653744
OPTN – var 1	20149572	16550123
OPTN – var 2	21619683	3387890
OPTN – var 3	3329431	3127082
OPTN – var 4	3127083	3329430
OPTN – var 5	*	21619682
OPTN – var 6	*	18644681
OPTN – var 7	*	18644683
OPTN – var 8	*	18644685
OPTN – var 9	*	20149571
FLJ37147 – var 1	21753535	21753534
FLJ37147 – var 2	30153743	30153742
KHDRBS1 – var 1	21749696	189499
KHDRBS1 – var 2	1841747	12653852
KHDRBS1 – var 3	189500	17512262
KHDRBS1 – var 4	*	14714433
KHDRBS1 – var 5	*	1841746
KHDRBS1 – var 6	*	21749695
SLC2A1 – var 1	3387905	3387904
SLC2A1 – var 2	5730051	5730050
SLC2A1 – var 3	14268550	14268549
DKFZp434B1231 – var 1	6808117	6808116
NUMA1 – var 1	27694103	5453819
NUMA1 – var 2	35119	13278785

Protein and Variant	Protein Sequence (public gi No.)	mRNA Sequence (public gi No.)
NUMA1 - var 3	14249928	14249927
NUMA1 - var 4	13278786	15991876
NUMA1 - var 5	5453820	296118
NUMA1 - var 6	*	296119
NUMA1 - var 7	*	296120
NUMA1 - var 8	*	35118
NUMA1 - var 9	*	20073234
NUMA1 - var 10	*	22477305
NUMA1 - var 11	*	22749583
NUMA1 - var 12	*	27694102
HSPC016 - var 1	6841310	12654536
HSPC016 - var 2	12654537	6841309
HSPC016 - var 3	*	4679017
HSPC016 - var 4	*	10834763
UBC - var 1	5912028	3360475
UBC - var 2	340058	2647407
UBC - var 3	340068	24657521
UBC - var 4	14286308	21751700
UBC - var 5	15928840	21757163
UBC - var 6	16552475	21758959
UBC - var 7	*	16552474
UBC - var 8	*	15928839
UBC - var 9	*	14286307
UBC - var 10	*	12653358
UBC - var 11	*	10439801
UBC - var 12	*	340067
UBC - var 13	*	340057
UBC - var 14	*	5912027
ZFM1 - var 1	785999	785998
PIASY - var 1	14603164	3643110
PIASY - var 2	5533373	5533372
PIASY - var 3	24850133	10433892
PIASY - var 4	3643111	14603163
PIASY - var 5	*	20987516
PIASY - var 6	*	14709019
XM_208944 - var 1	30153743	30153742
J03930 - var 1	178442	178441
MT2A - var 1	187528	37120
MT2A - var 2	37121	263506
MT2A - var 3	*	13937856
MT2A - var 4	*	1495465
MT2A - var 5	*	187527
EWSR1 - var 1	7669490	21734132
EWSR1 - var 2	12653511	547565

Protein and Variant	Protein Sequence (public gi No.)	mRNA Sequence (public gi No.)
EWSR1 – var 3	15029675	21756356
EWSR1 – var 4	16552153	16551673
EWSR1 – var 5	16551674	16552152
EWSR1 – var 6	31280	15029674
EWSR1 – var 7	*	13435962
EWSR1 – var 8	*	12653510
EWSR1 – var 9	*	10439073
EWSR1 – var 10	*	7669489
MADH6 – var 1	2828712	1654326
MADH6 – var 2	2736316	20379504
MADH6 – var 3	1654327	2736315
MADH6 – var 4	*	2828711
MADH6 – var 5	*	15278059
THOC2 – var 1	20799318	10435649
THOC2 – var 2	10435650	20799317
THOC2 – var 3	*	7023224
ZNF151 – var 1	676873	2230870
ZNF151 – var 2	2230871	676872
DDX31 – var 1	10435700	14042193
DDX31 – var 2	10440004	15215272
DDX31 – var 3	20336298	16566549
DDX31 – var 4	16566550	20336297
DDX31 – var 5	15215273	20336296
DDX31 – var 6	14042194	10440003
DDX31 – var 7	*	10435699
POLR2J2 – var 1	11595478	21704271
POLR2J2 – var 2	21704274	21704270
POLR2J2 – var 3	19401711	19401710
POLR2J2 – var 4	14702175	21704273
POLR2J2 – var 5	21704272	16878085
POLR2J2 – var 6	*	11595475
POLR2J2 – var 7	*	11595477
POLR2J2 – var 8	*	11595473
BANF1 – var 1	3002951	11038645
BANF1 – var 2	4502389	13543576
BANF1 – var 3	*	14713907
BANF1 – var 4	*	3002950
BANF1 – var 5	*	4321975
BANF1 – var 6	*	3220254
CBX4 – var 1	1945453	1945452
CBX4 – var 2	15929016	2317722
CBX4 – var 3	2317723	15929015
ARIH2 – var 1	3925604	3925603
ARIH2 – var 2	9963793	3930777

Protein and Variant	Protein Sequence (public gi No.)	mRNA Sequence (public gi No.)
ARIH2 - var 3	12653307	3986675
ARIH2 - var 4	*	3986676
ARIH2 - var 5	*	3986677
ARIH2 - var 6	*	7328049
ARIH2 - var 7	*	6855602
ARIH2 - var 8	*	21749565
ARIH2 - var 9	*	33875424
ARIH2 - var 10	*	9963792
ARIH2 - var 11	*	5453556
ARIH2 - var 12	*	5817100
ARIH2 - var 13	*	3930775
SRPK2 - var 1	1857944	21752284
SRPK2 - var 2	23270876	21749007
SRPK2 - var 3	*	23270875
SRPK2 - var 4	*	1857943
SIAH2 - var 1	2673968	16549991
SIAH2 - var 2	2664283	34189635
SIAH2 - var 3	*	2664282
SIAH2 - var 4	*	2673967
KIAA0191 - var 1	27480017	29387261
KIAA0191 - var 2	1228035	10438300
KIAA0191 - var 3	29387262	1228034
KIAA0191 - var 4	*	21755057
KIAA0191 - var 5	*	27480016
KIAA0191 - var 6	*	19387907
KIAA0191 - var 7	*	15636651
KIAA0191 - var 8	*	23273514
PA1-RBP1 - var 1	5262551	22760761
PA1-RBP1 - var 2	4929579	20072477
PA1-RBP1 - var 3	12804377	17939456
PA1-RBP1 - var 4	12803339	18088243
PA1-RBP1 - var 5	14029171	16924316
PA1-RBP1 - var 6	18088244	33872286
PA1-RBP1 - var 7	22760762	14029170
PA1-RBP1 - var 8	*	33876749
PA1-RBP1 - var 9	*	12804376
PA1-RBP1 - var 10	*	4929578
PA1-RBP1 - var 11	*	4406639
PA1-RBP1 - var 12	*	5262550
FAT - var 1	2281025	1107686
FAT - var 2	1107687	15214611
FAT - var 3	*	2281024
FAT - var 4	*	598748
VCL - var 1	24657579	7669551

Protein and Variant	Protein Sequence (public gi No.)	mRNA Sequence (public gi No.)
VCL - var 2	340237	7669549
VCL - var 3	7669550	340236
VCL - var 4	*	21732673
VCL - var 5	*	15426616
VCL - var 6	*	246657578
SSR4 - var 1	15929882	30583222
SSR4 - var 2	13097213	1071680
SSR4 - var 3	*	22749791
SSR4 - var 4	*	21753447
SSR4 - var 5	*	16552704
SSR4 - var 6	*	15929881
SSR4 - var 7	*	13097212
SSR4 - var 8	*	2398656
PRDX5 - var 1	6166493	27484966
PRDX5 - var 2	6746355	9802047
PRDX5 - var 3	9802048	8745393
PRDX5 - var 4	27484967	6746354
PRDX5 - var 5	*	6563211
PRDX5 - var 6	*	6103723
PRDX5 - var 7	*	6166492
PRDX5 - var 8	*	6523288
PRDX5 - var 9	*	32455258
FLJ10120 - var 1	8922239	27469671
FLJ10120 - var 2	*	8922238
PROL4 - var 1	22208536	22208535
PROL4 - var 2	6005802	1050982
CL25084 - var 1	15341891	4406555
CL25084 - var 2	7023472	4406692
CL25084 - var 3	4406693	7023471
CL25084 - var 4	4406556	15341890
C11orf17 - var 1	22761313	21361869
C11orf17 - var 2	21105773	20149226
C11orf17 - var 3	20149225	20149224
C11orf17 - var 4	20149227	21105772
C11orf17 - var 5	21361870	21410957
C11orf17 - var 6	*	22761312
POLQ - var 1	3510695	13892060
POLQ - var 2	4163931	13892060
POLQ - var 3	13892061	4163930
POLQ - var 4	*	3510694
MBD2 - var 1	3170202	3800812
MBD2 - var 2	3800801	5817231
MBD2 - var 3	7710145	21595775
MBD2 - var 4	21595776	21464120

Protein and Variant	Protein Sequence (public gi No.)	mRNA Sequence (public gi No.)
MBD2 - var 5	*	21464121
MBD2 - var 6	*	3800800
MBD2 - var 7	*	3800792
MBD2 - var 8	*	3170201
FSTL1 - var 1	12658309	536897
FSTL1 - var 2	12652619	16924272
FSTL1 - var 3	*	33990756
FSTL1 - var 4	*	12658308
FSTL1 - var 5	*	10438502
FSTL1 - var 6	*	4884472

\* denotes a polypeptide sequence that can be deduced from the corresponding mRNA sequence.

5

9. Effective Dose

Toxicity and therapeutic efficacy of such compounds can be determined by standard pharmaceutical procedures in cell cultures or experimental animals, e.g., for determining The LD50 (the dose lethal to 50% of the population) and the ED50 (the dose therapeutically effective in 50% of the population). The dose ratio between toxic and therapeutic effects is the therapeutic index and it can be expressed as the ratio LD50/ED50. Compounds which exhibit large therapeutic indices are preferred. While compounds that exhibit toxic side effects may be used, care should be taken to design a delivery system that targets such compounds to the site of affected tissue in order to minimize potential damage to uninfected cells and, thereby, reduce side effects.

The data obtained from the cell culture assays and animal studies can be used in formulating a range of dosage for use in humans. The dosage of such compounds lies preferably within a range of circulating concentrations that include the ED50 with little or no toxicity. The dosage may vary within this range depending upon the dosage form employed and the route of administration utilized. For any compound used in the method of the application, the therapeutically effective dose can be estimated initially from cell culture assays. A dose may be formulated in animal models to achieve a circulating plasma concentration range that includes the IC50 (i.e., the concentration of the test compound which achieves a half-maximal

inhibition of symptoms) as determined in cell culture. Such information can be used to more accurately determine useful doses in humans. Levels in plasma may be measured, for example, by high performance liquid chromatography.

5    10. Formulation and Use

Pharmaceutical compositions for use in accordance with the present application may be formulated in conventional manner using one or more physiologically acceptable carriers or excipients. Thus, the compounds and their physiologically acceptable salts and solvates may be formulated for administration 10 by, for example, injection, inhalation or insufflation (either through the mouth or the nose) or oral, buccal, parenteral or rectal administration.

An exemplary composition of the application comprises an RNAi mixed with a delivery system, such as a liposome system, and optionally including an acceptable excipient. In a preferred embodiment, the composition is formulated for 15 topical administration for, e.g., herpes virus infections.

For such therapy, the compounds of the application can be formulated for a variety of loads of administration, including systemic and topical or localized administration. Techniques and formulations generally may be found in Remington's Pharmaceutical Sciences, Meade Publishing Co., Easton, PA. For 20 systemic administration, injection is preferred, including intramuscular, intravenous, intraperitoneal, and subcutaneous. For injection, the compounds of the application can be formulated in liquid solutions, preferably in physiologically compatible buffers such as Hank's solution or Ringer's solution. In addition, the compounds may be formulated in solid form and redissolved or suspended immediately prior to 25 use. Lyophilized forms are also included.

For oral administration, the pharmaceutical compositions may take the form of, for example, tablets or capsules prepared by conventional means with pharmaceutically acceptable excipients such as binding agents (e.g., pregelatinised maize starch, polyvinylpyrrolidone or hydroxypropyl methylcellulose); fillers (e.g., lactose, microcrystalline cellulose or calcium hydrogen phosphate); lubricants (e.g., magnesium stearate, talc or silica); disintegrants (e.g., potato starch or sodium starch glycolate); or wetting agents (e.g., sodium lauryl sulphate). The tablets may be

coated by methods well known in the art. Liquid preparations for oral administration may take the form of, for example, solutions, syrups or suspensions, or they may be presented as a dry product for constitution with water or other suitable vehicle before use. Such liquid preparations may be prepared by conventional means with pharmaceutically acceptable additives such as suspending agents (e.g., sorbitol syrup, cellulose derivatives or hydrogenated edible fats); emulsifying agents (e.g., lecithin or acacia); non-aqueous vehicles (e.g., ationd oil, oily esters, ethyl alcohol or fractionated vegetable oils); and preservatives (e.g., methyl or propyl-p-hydroxybenzoates or sorbic acid). The preparations may also contain buffer salts, flavoring, coloring and sweetening agents as appropriate.

Preparations for oral administration may be suitably formulated to give controlled release of the active compound. For buccal administration the compositions may take the form of tablets or lozenges formulated in conventional manner. For administration by inhalation, the compounds for use according to the present application are conveniently delivered in the form of an aerosol spray presentation from pressurized packs or a nebuliser, with the use of a suitable propellant, e.g., dichlorodifluoromethane, trichlorofluoromethane, dichlorotetrafluoroethane, carbon dioxide or other suitable gas. In the case of a pressurized aerosol the dosage unit may be determined by providing a valve to deliver a metered amount. Capsules and cartridges of e.g., gelatin for use in an inhaler or insufflator may be formulated containing a powder mix of the compound and a suitable powder base such as lactose or starch.

The compounds may be formulated for parenteral administration by injection, e.g., by bolus injection or continuous infusion. Formulations for injection may be presented in unit dosage form, e.g., in ampoules or in multi-dose containers, with an added preservative. The compositions may take such forms as suspensions, solutions or emulsions in oily or aqueous vehicles, and may contain formulatory agents such as suspending, stabilizing and/or dispersing agents. Alternatively, the active ingredient may be in powder form for constitution with a suitable vehicle, e.g., sterile pyrogen-free water, before use.

The compounds may also be formulated in rectal compositions such as suppositories or retention enemas, e.g., containing conventional suppository bases such as cocoa butter or other glycerides.

In addition to the formulations described previously, the compounds may 5 also be formulated as a depot preparation. Such long acting formulations may be administered by implantation (for example subcutaneously or intramuscularly) or by intramuscular injection. Thus, for example, the compounds may be formulated with suitable polymeric or hydrophobic materials (for example as an emulsion in an acceptable oil) or ion exchange resins, or as sparingly soluble derivatives, for 10 example, as a sparingly soluble salt.

Systemic administration can also be by transmucosal or transdermal means. For transmucosal or transdermal administration, penetrants appropriate to the barrier to be permeated are used in the formulation. Such penetrants are generally known in the art, and include, for example, for transmucosal administration bile salts and fusidic acid derivatives. In addition, detergents may be used to facilitate permeation. 15 Transmucosal administration may be through nasal sprays or using suppositories. For topical administration, the oligomers of the application are formulated into ointments, salves, gels, or creams as generally known in the art. A wash solution can be used locally to treat an injury or inflammation to accelerate healing.

20 The compositions may, if desired, be presented in a pack or dispenser device which may contain one or more unit dosage forms containing the active ingredient. The pack may for example comprise metal or plastic foil, such as a blister pack. The pack or dispenser device may be accompanied by instructions for administration.

For therapies involving the administration of nucleic acids, the oligomers of 25 the application can be formulated for a variety of modes of administration, including systemic and topical or localized administration. Techniques and formulations generally may be found in Remington's Pharmaceutical Sciences, Meade Publishing Co., Easton, PA. For systemic administration, injection is preferred, including intramuscular, intravenous, intraperitoneal, intranodal, and subcutaneous 30 for injection, the oligomers of the application can be formulated in liquid solutions, preferably in physiologically compatible buffers such as Hank's solution or Ringer's solution. In addition, the oligomers may be formulated in solid form and

redissolved or suspended immediately prior to use. Lyophilized forms are also included.

Systemic administration can also be by transmucosal or transdermal means, or the compounds can be administered orally. For transmucosal or transdermal administration, penetrants appropriate to the barrier to be permeated are used in the formulation. Such penetrants are generally known in the art, and include, for example, for transmucosal administration bile salts and fusidic acid derivatives. In addition, detergents may be used to facilitate permeation. Transmucosal administration may be through nasal sprays or using suppositories. For oral administration, the oligomers are formulated into conventional oral administration forms such as capsules, tablets, and tonics. For topical administration, the oligomers of the application are formulated into ointments, salves, gels, or creams as generally known in the art.

The application now being generally described, it will be more readily understood by reference to the following examples, which are included merely for purposes of illustration of certain aspects and embodiments of the present application, and are not intended to limit the application.

## EXAMPLES

### Example 1. Role of POSH in virus-like particle (VLP) budding

#### 1. Objective:

Use RNAi to inhibit POSH gene expression and compare the efficiency of viral budding and GAG expression and processing in treated and untreated cells.

#### 2. Study Plan:

HeLa SS-6 cells are transfected with mRNA-specific RNAi in order to knockdown the target proteins. Since maximal reduction of target protein by RNAi is achieved after 48 hours, cells are transfected twice – first to reduce target mRNAs, and subsequently to express the viral Gag protein. The second transfection is performed with pNLenv (plasmid that encodes HIV) and with low amounts of RNAi to maintain the knockdown of target protein during the time of gag expression and

budding of VLPs. Reduction in mRNA levels due to RNAi effect is verified by RT-PCR amplification of target mRNA.

3. Methods, Materials, Solutions

a. Methods

5 i. Transfections according to manufacturer's protocol and as described in procedure.

ii. Protein determined by Bradford assay.

iii. SDS-PAGE in Hoeffer miniVE electrophoresis system. Transfer in Bio-Rad mini-protean II wet transfer system. Blots visualized using Typhoon system, and ImageQuant software (ABbiotech)

10 b. Materials

Material	Manufacturer	Catalog #	Batch #
Lipofectamine 2000 (LF2000)	Life Technologies	11668-019	1112496
OptiMEM	Life Technologies	31985-047	3063119
RNAi Lamin A/C	Self	13	
RNAi TSG101 688	Self	65	
RNAi Posh 524	Self	81	
plenvl1 PTAP	Self	148	
plenvl1 ATAP	Self	149	
Anti-p24 polyclonal antibody	Seramun		A-0236/5-10-01
Anti-Rabbit Cy5 conjugated antibody	Jackson	144-175-115	48715
10% acrylamide Tris-Glycine SDS-PAGE gel	Life Technologies	NP0321	1081371
Nitrocellulose membrane	Schleicher & Schuell	401353	BA-83
NuPAGE 20X transfer buffer	Life Technologies	NP0006-1	224365
0.45µm filter	Schleicher &	10462100	CS1018-1

	Schuell		
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c. Solutions

Lysis Buffer	Compound	Concentration
	Tris-HCl pH 7.6	50mM
	MgCl <sub>2</sub>	15mM
	NaCl	150mM
	Glycerol	10%
	EDTA	1mM
	EGTA	1mM
	ASB-14 (add immediately before use)	1%
6X Sample Buffer	Tris-HCl, pH=6.8	1M
	Glycerol	30%
	SDS	10%
	DTT	9.3%
	Bromophenol Blue	0.012%
TBS-T	Tris pH=7.6	20mM
	NaCl	137mM
	Tween-20	0.1%

4. Procedure

5 a. Schedule

Day				
1	2	3	4	5
Plate cells	Transfection I (RNAi only)	Passage cells (1:3)	Transfection II (RNAi and pNlenv) (12:00, PM)	Extract RNA for RT-PCR (post transfection)

			Extract RNA for RT-PCR (pre-transfection)	Harvest VLPs and cells
--	--	--	---	------------------------

b. Day 1

Plate HeLa SS-6 cells in 6-well plates (35mm wells) at concentration of  $5 \times 10^5$  cells/well.

5 c. Day 2

2 hours before transfection replace growth medium with 2 ml growth medium without antibiotics.

Transfection I:

Reaction	RNAi name	TAGDA#	Reactions	RNAi [nM]	RNAi	A	B
					[20μM]	OPTiMEM	LF2000 mix
1	Lamin A/C	13	2	50	12.5	500	500
2	Lamin A/C	13	1	50	6.25	250	250
3	TSG101 688	65	2	20	5	500	500
5	Posh 524	81	2	50	12.5	500	500

10 Transfections:

Prepare LF2000 mix: 250 μl OptiMEM + 5 μl LF2000 for each reaction. Mix by inversion, 5 times. Incubate 5 minutes at room temperature.

15 Prepare RNA dilution in OptiMEM (Table 1, column A). Add LF2000 mix dropwise to diluted RNA (Table 1, column B). Mix by gentle vortex. Incubate at room temperature 25 minutes, covered with aluminum foil.

Add 500 μl transfection mixture to cells dropwise and mix by rocking side to side.

Incubate overnight.

d. Day 3

20 Split 1:3 after 24 hours. (Plate 4 wells for each reaction, except reaction 2 which is plated into 3 wells.)

e. Day 4

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2 hours pre-transfection replace medium with DMEM growth medium without antibiotics.

**Transfection II**

RNAi name	TAG DA#	Plasmid	Reaction for 2.4 µg #	RNAi			
				Plasmid	[20µM] for 10nM	C	D
				(µl)	(µl)	OptiMEM (µl)	LF2000 mix (µl)
Lamin				3.4			
A/C	13	PTAP	3		3.75	750	750
Lamin				2.5			
A/C	13	ATAP	3		3.75	750	750
TSG101				3.4			
688	65	PTAP	3		3.75	750	750
Posh 524	81	PTAP	3	3.4	3.75	750	750

- 5      Prepare LF2000 mix: 250 µl OptiMEM + 5 µl LF2000 for each reaction. Mix by inversion, 5 times. Incubate 5 minutes at room temperature.  
 Prepare RNA+DNA diluted in OptiMEM (Transfection II, A+B+C)  
 Add LF2000 mix (Transfection II, D) to diluted RNA+DNA dropwise, mix by gentle vortex, and incubate 1h while protected from light with aluminum foil.
- 10     Add LF2000 and DNA+RNA to cells, 500µl/well, mix by gentle rocking and incubate overnight.
- f. Day 5
- 15     Collect samples for VLP assay (approximately 24 hours post-transfection) by the following procedure (cells from one well from each sample is taken for RNA assay, by RT-PCR).
- g. Cell Extracts
- i. Pellet floating cells by centrifugation (5min, 3000 rpm at 4 °C), save supernatant (continue with supernatant immediately to step h), scrape remaining cells in the medium which remains in the well, add to the corresponding floating cell pellet and centrifuge for 5 minutes, 1800rpm at 4°C.
- 20

- ii. Wash cell pellet twice with ice-cold PBS.
  - iii. Resuspend cell pellet in 100 µl lysis buffer and incubate 20 minutes on ice.
  - iv. Centrifuge at 14,000 rpm for 15 min. Transfer supernatant to a clean tube. This is the cell extract.
- 5
- v. Prepare 10 µl of cell extract samples for SDS-PAGE by adding SDS-PAGE sample buffer to 1X, and boiling for 10 minutes. Remove an aliquot of the remaining sample for protein determination to verify total initial starting material. Save remaining cell extract at -80 °C.
- 10 h. Purification of VLPs from cell media
  - i. Filter the supernatant from step g through a 0.45m filter.
  - ii. Centrifuge supernatant at 14,000 rpm at 4 °C for at least 2 h.
  - iii. Aspirate supernatant carefully.
  - iv. Re-suspend VLP pellet in hot (100 °C warmed for 10 min at least) 1X sample buffer.
  - v. Boil samples for 10 minutes, 100 °C.

15 i. Western Blot analysis
  - i. Run all samples from stages A and B on Tris-Glycine SDS-PAGE 10% (120V for 1.5 h).
  - ii. Transfer samples to nitrocellulose membrane (65V for 1.5 h).
  - iii. Stain membrane with ponceau S solution.
  - iv. Block with 10% low fat milk in TBS-T for 1 h.
  - v. Incubate with anti p24 rabbit 1:500 in TBS-T o/n.
  - vi. Wash 3 times with TBS-T for 7 min each wash.

20 vii. Incubate with secondary antibody anti rabbit cy5 1:500 for 30 min.

25 viii. Wash five times for 10 min in TBS-T.

ix. View in Typhoon gel imaging system (Molecular Dynamics/APBiotech) for fluorescence signal.

Results are shown in Figures 11-13.

30

Example 2. Exemplary POSH RT-PCR primers and siRNA duplexes

RT-PCR primers

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	Name	Position	Sequence
Sense primer	POSH=271	271	5' CTTGCCTGCCAGCATA 3' (SEQ ID NO:12)
Anti-sense primer	POSH=926c	926C	5' CTGCCAGCATTCCCTCAG 3' (SEQ ID NO:13)

**siRNA duplexes:**

siRNA No:	153	
siRNA Name:	POSH-230	
5 Position in mRNA	426-446	
Target sequence:	5' AACAGAGGCCTTGGAAACCTG 3'	SEQ ID NO: 14
siRNA sense strand:	5' dTdTCAGAGGCCUUGGAAACCUG 3'	SEQ ID NO: 15
siRNA anti-sense strand:	5'dTdTCAGGUUUCCAAGGCCUCUG 3'	SEQ ID NO: 16
10 siRNA No:	155	
siRNA Name:	POSH-442	
Position in mRNA	638-658	
Target sequence:	5' AAAGAGCCTGGAGACCTTAAA 3'	SEQ ID NO: 17
siRNA sense strand:	5' ddTdTAGAGCCUGGAGACCUUAAA 3'	SEQ ID NO: 18
15 siRNA anti-sense strand:	5' ddTdTUUAAGGUCUCCAGGCUCU 3'	SEQ ID NO: 19
siRNA No:	157	
siRNA Name:	POSH-U111	
Position in mRNA	2973-2993	
20 Target sequence:	5' AAGGATTGGTATGTGACTCTG 3'	SEQ ID NO: 20
siRNA sense strand:	5' dTdTGGAUUGGU AUGUGACUCUG 3'	SEQ ID NO: 21
siRNA anti-sense strand:	5' dTdTCAGAGUCACAUACCAAUCC 3'	SEQ ID NO: 22
siRNA No:	159	
25 siRNA Name:	POSH-U410	
Position in mRNA	3272-3292	
Target sequence:	5' AAGCTGGATTATCTCCTGTTG 3'	SEQ ID NO: 23
siRNA sense strand:	5' ddTdTGCUGGAUUA UCUCCUGUUG 3'	SEQ ID NO: 24

siRNA anti-sense strand: 5' ddTdTCAACAGGAG AUAAUCCAGC 3' SEQ ID NO: 25

siRNA-No.: 187  
siRNA Name: POSH-control  
5 Position in mRNA: None. Reverse to #153  
Target sequence: 5' AAGTCCAAAGGTTCCGGAGAC 3' SEQ ID  
NO: 36

3. Knock-down of hPOSH entraps HIV virus particles in intracellular vesicles.

10 HIV virus release was analyzed by electron microscopy following siRNA and full-length HIV plasmid (missing the envelope coding region) transfection. Mature viruses were secreted by cells transfected with HIV plasmid and non-relevant siRNA (control, lower panel). Knockdown of Tsg101 protein resulted in a budding defect, the viruses that were released had an immature phenotype (upper panel). Knockdown of hPOSH levels resulted in accumulation of viruses inside the cell in intracellular vesicles (middle panel). Results, shown in Figure 28, indicate that inhibiting hPOSH entraps HIV virus particles in intracellular vesicles. As accumulation of HIV virus particles in the cells accelerate cell death, inhibition of hPOSH therefore destroys HIV reservoir by killing cells infected with HIV.

20

Example 4. In-vitro assay of Human POSH self-ubiquitination

Recombinant hPOSH was incubated with ATP in the presence of E1, E2 and ubiquitin as indicated in each lane. Following incubation at 37 °C for 30 minutes, reactions were terminated by addition of SDS-PAGE sample buffer. The samples were subsequently resolved on a 10% polyacrylamide gel. The separated samples were then transferred to nitrocellulose and subjected to immunoblot analysis with an anti ubiquitin polyclonal antibody. The position of migration of molecular weight markers is indicated on the right.

30 Poly-Ub: Ub-hPOSHconjugates, detected as high molecular weight adducts only in reactions containing E1, E2 and ubiquitin. hPOSH-176 and hPOSH-178 are a short

and a longer derivatives (respectively) of bacterially expressed hPOSH; C, control E3.

Preliminary steps in a high-throughput screen

Materials

- 5    1. E1 recombinant from baculovirus
  2. E2 Ubch5c from bacteria
  3. Ubiquitin
  4. POSH #178 (1-361) GST fusion-purified but degraded
  5. POSH # 176 (1-269) GST fusion-purified but degraded
  - 10    6. hsHRD1 soluble ring containing region
  5. Bufferx12 (Tris 7.6 40 mM, DTT 1mM, MgCl<sub>2</sub> 5mM, ATP 2uM)
  6. Dilution buffer (Tris 7.6 40mM, DTT 1mM, ovalbumin 1ug/ul)
- protocol

	0.1ug/ul	0.5ug/ul	5ug/ul	0.4ug/ul	2.5ug/u/	0.8ug/ul	
	<b>E1</b>	<b>E2</b>	<b>Ub</b>	<b>176</b>	<b>178</b>	<b>Hrd1</b>	<b>Bx12</b>
<b>-E1 (E2+176)</b>	-----	0.5	0.5	1	-----	-----	10
<b>-E2 (E1+176)</b>	1	-----	0.5	1	-----	-----	9.5
<b>-ub (E1+E2+176)</b>	1	0.5	-----	1	-----	-----	9.5
<b>E1+E2+176+Ub</b>	1	0.5	0.5	1	-----	-----	9
<b>-E1 (E2+178)</b>	-----	0.5	0.5	-----	1	-----	10
<b>-E2 (E1+178)</b>	1	-----	0.5	-----	1	-----	9.5
<b>-ub (E1+E2+178)</b>	1	0.5	-----	-----	1	-----	9.5
<b>E1+E2+178+Ub</b>	1	0.5	0.5	-----	1	-----	9
<b>Hrd1, E1+E2+Ub</b>	1	0.5	0.5	-----	-----	1	8.5

\*

- 15    1. Incubate for 30 minutes at 37 °C.
2. Run 12% SDS PAGE gel and transfer to nitrocellulose membrane
3. Incubate with anti-Ubiquitin antibody.

Results, shown in Figure 19, demonstrate that human POSH has ubiquitin ligase activity.

Example 5. Co-immunoprecipitation of hPOSH with myc-tagged activated (V12) and dominant-negative (N17) Rac1

HeLa cells were transfected with combinations of myc-Rac1 V12 or N17 and hPOSHdelRING-V5. 24 hours after transfection (efficiency 80% as measured by GFP) cells were collected, washed with PBS, and swollen in hypotonic lysis buffer (10 mM HEPES pH=7.9, 15 mM KCl, 0.1 mM EDTA, 2 mM MgCl<sub>2</sub>, 1 mM DTT, and protease inhibitors). Cells were lysed by 10 strokes with dounce homogenizer and centrifuged 3000xg for 10 minutes to give supernatant (Fraction 1) and nuclei. Nuclei were washed with Fraction 2 buffer (0.2% NP-40, 10 mM HEPES pH=7.9, 10 mM KCl, 5% glycerol) to remove peripheral proteins. Nuclei were spun-down and supernatant collected (Fraction 2). Nuclear proteins were eluted in Fraction 3 buffer (20 mM HEPES pH=7.9, 0.42 M KCl, 25% glycerol, 0.1 mM EDTA, 2 mM MgCl<sub>2</sub>, 1 mM DTT) by rotating 30 minutes in cold. Insoluble proteins were spun-down 14000xg and solubilized in Fraction 4 buffer (1% Fos-Choline 14, 50 mM HEPES pH=7.9; 150 mM NaCl, 10% glycerol, 1mM EDTA, 1.5 mM MgCl<sub>2</sub>, 2 mM DTT). Half of the total extract was pre-cleared against Protein A sepharose for 1.5 hours and used for IP with 1 µg anti-myc (9E10, Roche 1-667-149) and Protein A sepharose for 2 hours. Immune complexes were washed extensively, and eluted in SDS-PAGE sample buffer. Gels were run, and proteins electro-transferred to nitrocellulose for immunoblot as in Figure 20. Endogenous POSH and transfected hPOSHdelRING-V5 are precipitated as a complex with Myc-Rac1 V12/N17. Results, shown in Figure 20, demonstrate that POSH co-immunoprecipitates with Rac1.

25 Example 6. POSH reduction results in decreased secretion of phospholipase D (PLD)

HeLa SS6 cells (two wells of 6-well plate) were transfected with POSH siRNA or control siRNA (100 nM). 24 hours later each well was split into 5 wells of a 24-well plate. The next day cells were transfected again with 100 nM of either POSH siRNA or control siRNA. The next day cells were washed three times with 1xPBS and than 0.5 ml of PLD incubation buffer (118 mM NaCl, 6 mM KCl, 1 mM

CaCl<sub>2</sub>, 1.2 mM MgSO<sub>4</sub>, 12.4 mM HEPES, pH7.5 and 1% fatty acid free bovine serum albumin) were added.

48 hours later medium was collected and centrifuged at 800xg for 15 minutes. The medium was diluted with 5xPLD reaction buffer (Amplex red PLD kit) and assayed for PLD by using the Amplex Red PLD kit (Molecular probes, A-12219). The assay results were quantified and presented below in as a bar graph. The cells were collected and lysed in 1% Triton X-100 lysis buffer (20 mM HEPES-NaOH, pH 7.4, 150 mM NaCl, 1.5 mM MgCl<sub>2</sub>, 1 mM EDTA, 1% Triton X-100 and 1x protease inhibitors) for 15 minutes on ice. Lysates were cleared by centrifugation and protein concentration was determined. There were equal protein concentrations between the two transfectants. Equal amount of extracts were immunoprecipitated with anti-POSH antibodies, separated by SDS-PAGE and immunoblotted with anti-POSH antibodies to assess the reduction of POSH levels. There was approximately 40% reduction in POSH levels (Figure 21).

15

Example 7. Effect of hPOSH on Gag-EGFP intracellular distribution

HeLa SS6 were transfected with Gag-EGFP, 24 hours after an initial transfection with either hPOSH-specific or scrambled siRNA (control) (100nM) or with plasmids encoding either wild type hPOSH or hPOSH C(12,55)A. Fixation and staining was performed 5 hours after Gag-EGFP transfection. Cells were fixed, stained with Alexa fluor 647-conjugated Concanavalin A (ConA) (Molecular Probes), permeabilized and then stained with sheep anti-human TGN46. After the primary antibody incubation cells were incubated with Rhodamin-conjugated goat anti-sheep. Laser scanning confocal microscopy was performed on LSM510 confocal microscope (Zeiss) equipped with Axiovert 100M inverted microscope using x40 magnification and 1.3-numerical-aperture oil-immersion lens for imaging. For co-localization experiments, 10 optical horizontal sections with intervals of 1  $\mu$ m were taken through each preparation (Z-stack). A single median section of each preparation is shown. See Figure 22.

30

Example 8. POSH-Regulated Intracellular Transport of Myristoylated Proteins

The localization of myristoylated proteins, Gag (see Figure 22), HIV-1 Nef, Src and Rapsyn, in cells depleted of hPOSH were analyzed by immunofluorescence. In control cells, HIV-1 Nef was found in a perinuclear region co-localized with hPOSH, indicative of a TGN localization (Figure 23). When hPOSH expression was 5 reduced by siRNA treatment, Nef expression was weaker relative to control and nef lost its TGN, perinuclear localization. Instead it accumulated in punctated intracellular loci segregated from the TGN.

Src is expressed at the plasma membrane and in intracellular vesicles, which are found close to the plasma membrane (Figure 24, H187 cells). However, when 10 hPOSH levels were reduced, Src was dispersed in the cytoplasm and loses its plasma membrane proximal localization detected in control (H187) cells (Figure 24, compare H153-1 and H187-2 panels).

Rapsyn, a peripheral membrane protein expressed in skeletal muscle, plays a critical role in organizing the structure of the nicotinic postsynaptic membrane 15 (Sanes and Lichtman, Annu. Rev. Neurosci. 22: 389-442 (1999)). Newly synthesized Rapsyn associates with the TGN and then transported to the plasma membrane (Marchand et al., J. Neurosci. 22: 8891-01 (2002)). In hPOSH-depleted cells (H153-1) Rapsyn was dispersed in the cytoplasm, while in control cells it had a punctuated pattern and plasma membrane localization, indicating that hPOSH 20 influences its intracellular transport (Figure 25).

#### Materials and Methods Used:

- Antibodies:

Src antibody was purchased from Oncogene research products( Darmstadt, 25 Germany). Nef antibodies were purchased from ABI (Columbia, MA) and Fitzgerald Industries International (Concord, MA). Alexa Fluor conjugated antibodies were purchased from Molecular Probes Inc. (Eugene, OR).

hPOSH antibody: Glutathione S-transferase (GST) fusion plasmids were constructed by PCR amplification of hPOSH codons 285-430. The amplified PCR 30 products was cloned into pGEX-6P-2 (Amersham Pharmacia Biotech, Buckinghamshire, UK). The truncated hPOSH protein was generated in *E. coli*

BL21. Bacterial cultures were grown in LB media with carbenicillin (100 µg/ml) and recombinant protein production was induced with 1 mM IPTG for 4 hours at 30 °C. Cells were lysed by sonication and the recombinant protein was then isolated from the cleared bacterial lysate by affinity chromatography on a glutathione-sepharose resin (Amersham Pharmacia Biotech, Buckinghamshire, UK). The hPOSH portion of the fusion protein was then released by incubation with PreScission protease (Amersham Pharmacia Biotech, Buckinghamshire, UK) according to the manufacturer's instructions and the GST portion was then removed by a second glutathione-sepharose affinity chromatography. The purified partial hPOSH polypeptide was used to immunize New Zealand white rabbits to generate antibody 15B (Washington Biotechnology, Baltimore, Maryland).

• Construction of siRNA retroviral vectors:

hPOSH scrambled oligonucleotide (5'- CACACACTGCCG TCAACT GTTCAAGAGAC AGTTGACGGCAGTGTGTGTTTTT -3'; and 5'- AATTAAAAAACACA CACTGCCGTCAACTGTC TCTTGAACAGTTGA CGGCAGTGTGTGGGCC -3') were annealed and cloned into the ApaI-EcoRI digested pSilencer 1.0-US (Ambion) to generate pSIL-scrambled. Subsequently, the U6-promoter and RNAi sequences were digested with BamHI, the ends filled in and the insert cloned into the Olil site in the retroviral vector, pMSVhyg (Clontech), generating pMSCVhyg-U6-scrambled. hPOSH oligonucleotide encoding RNAi against hPOSH (5'-AACAGAGGCCTGGAAA CCTGGAAGC TTGCAGGTT CCAAGGCCTCTGTT -3'; and 5'- GATCACACAGAG GCCTTGAAACCTGC AAGCTTCCAGGTTCAA GGCCTCTGTT -3') were annealed and cloned into the BamHI-EcoRI site of pLIT-U6, generating pLIT-U6 hPOSH-230. pLIT-U6 is an shRNA vector containing the human U6 promoter (amplified by PCR from human genomic DNA with the primers, 5'-GGCCCCTAGTCA AGGTGCG GGCA GGAAGA- 3' and 5'- GCCGAATT CAAAAAGGATC CGGCGATATCCGG TGTTTCGTCTTCCA -3') cloned into pLITMUS38 (New England Biolabs) digested with SpeI-EcoRI. Subsequently, the U6 promoter-hPOSH shRNA (pLIT-U6 hPOSH-230 digested with SnaBI and PvuI) was cloned into the Olil site of pMSVhyg (Clontech), generating pMSCVhyg U6-hPOSH-230.

- Generation of stable clones:

HEK 293T cells were transfected with retroviral RNAi plasmids (pMSCVhyg-U6-POSH-230 and pMSCVhyg-U6-scrambled and with plasmids encoding VSV-G and moloney gag-pol. Two days post transfection, medium containing retroviruses was collected and filtered and polybrene was added to a final concentration of 8 µg/ml. This was used to infect HeLa SS6 cells grown in 60 mm dishes. Forty-eight hours post-infection cells were selected for RNAi expression by the addition of hygromycin to a final concentration of 300 µg/ml. Clones expressing RNAi against hPOSH were named H153, clones expressing scrambled RNAi were 10 named H187.

- Transfection and immunofluorescent analysis:

Gag-EGFP experiments are described in Figure 22.

H153 or H187 cells were transfected with Src or Rapsyn-GFP (Image clone image: 3530551 or pNLenv-1). Eighteen hours post transfection cells were washed 15 with PBS and incubated on ice with Alexa Fluor 647 conjugated Con A to label plasma membrane glycoproteins. Subsequently cells were fixed in 3% paraformaldehyde, blocked with PBS containing 4% bovine serum albumin and 1% gelatin. Staining with rabbit anti-Src, rabbit anti-hPOSH (15B) or mouse anti-nef was followed with secondary antibodies as indicated.

20 Laser scanning confocal microscopy was performed on LSM510 confocal microscope (Zeiss) equipped with Axiovert 100M inverted microscope using x40 magnification and 1.3-numerical-aperture oil-immersion lens for imaging. For co-localization experiments, 10 optical horizontal sections with intervals of 1 µm were taken through each preparation (Z-stack). A single median section of each 25 preparation is shown.

Example 9. POSH Reduction by siRNA Abrogates West Nile Virus ("WNV")

Infectivity.

HeLa SS6 cells were transfected with either control or POSH-specific 30 siRNA. Cells were subsequently infected with WNV ( $4 \times 10^4$  PFU/well). Viruses

were harvested 24 hours and 48 hours post-infection, serially diluted, and used to infect Vero cells. As a control WNV ( $4 \times 10^4$  PFU/well), that was not passed through HeLa SS6 cells, was used to infect Vero cells. Virus titer was determined by plaque assay in Vero cells.

5       Virus titer was reduced by 2.5-log in cells treated with POSH-specific siRNA relative to cells transfected with control siRNA, thereby indicating that WNV requires POSH for virus secretion. See Figure 26.

Experimental Procedure:

- 10      • Cell culture, transfections and infection:  
Hela SS6 cells were grown in Dulbecco's modified Eagle's medium (DMEM) supplemented with 10% heat-inactivated fetal calf serum and 100 units/ml penicillin and 100 µg/ml streptomycin. For transfections, HeLa SS6 cells were grown to 50% confluence in DMEM containing 10% FCS without antibiotics. Cells  
15     were then transfected with the relevant double-stranded siRNA (100 nM) using lipofectamin 2000 (Invitrogen, Paisley, UK). On the day following the initial transfection, cells were split 1:3 in complete medium and transfected with a second portion of double-stranded siRNA (50 nM). Six hours post-transfection medium was replaced and cells infected with WNV ( $4 \times 10^4$  PFU/well). Medium was collected  
20     from infected HeLa SS6 cells twenty-four and forty-eight post-infection (200 µl), serially diluted, and used to infect Vero cells. Virus titer was determined by plaque assay (Ben-Nathan D, Lachmi B, Lustig S, Feuerstien G (1991) Protection of dehydroepiandrosterone (DHEA) in mice infected with viral encephalitis. Arch Viro; 120, 263-271).

25      Example 10. Analysis of the effects of POSH knockdown on M-MuLV expression and budding

Experimental Protocol:

Transfections:-

30      A day before transfection, Hela SS6 cells were plated in two 6 wells plates at  $5 \times 10^5$  cells per well. 24 hours later the following transfections were performed: 4 wells were transfected with control siRNA and a plasmid encoding MMuLV.

4 wells were transfected with POSH siRNA and a plasmid encoding MMuLV.

1 well was a control without any siRNA or DNA transfected.

1 well was transfected with a plasmid encoding MMuLV.

For each well to be transfected 100 nM (12.5 µl) POSH siRNA or 100 nM (12.5 µl) control siRNA were diluted in 250 µl Opti-MEM (Invitrogen).

Lipofectamin 2000 (5 µl) (Invitrogen, Cat. 11668-019) was mixed with 250 µl of OptiMEM per transfected well. The diluted siRNA was mixed with the lipofectamin 2000 mix and the solution incubated at room temperature for 30 min. The mixture was added directly to each well containing 2 ml DMEM +10% FBS (w/o

10 antibiotics).

24 hours later, four wells of the same siRNA treatment were split to eight wells, and two wells without siRNA were split to four wells.

24 hours later all wells were transfected with 100 nM control siRNA or 100 nM POSH siRNA with or without a plasmid encoding MMuLV (see table below).

15 48 hours later virions and cells were harvested.

No of wells	RNAi	Amount of RNAi (µl) per well	Amount of DNA (µg) per well	The volume of DNA (µl) per well	Application
5	POSH 100 nM (1 <sup>st</sup> and 2 <sup>nd</sup> transfection)	12.5	MMuLV (2 µg)	10	4 wells for VLPs assay and 1 well for RT
5	Control 100 nM (1 <sup>st</sup> and 2 <sup>nd</sup> transfection)	12.5	MMuLV (2 µg)	10	4 wells for VLPs assay and 1 well for RT
1	-	-	-	10 µl H <sub>2</sub> O	VLPs assay
1	-	-	MMuLV (2 µg)	10	VLPs assay

#### Steady state VLP assay

#### Cell extracts:-

- 20 1. Pellet floating cells by centrifugation (10 min, 500xg at 4 °C), save supernatant (continued at step 7), wash cells once, scrape cells in ice-cold 1xPBS, add to the corresponding cell pellet and centrifuge for 5 min 1800 rpm at 4 °C.
2. Wash cell pellet once with ice-cold 1xPBS.

3. Resuspend cell pellet in 150 µl 1% Triton X-100 lysis buffer (20 mM HEPES-NaOH, pH 7.4, 150 mM NaCl, 1.5 mM MgCl<sub>2</sub>, 1 mM EDTA, 1% Triton X-100 and 1x protease inhibitors) and incubate 20 minutes on ice.
4. Centrifuge at 14,000rpm for 15 min. Transfer supernatant to a clean tube.
5. Determine protein concentration by BCA.
6. Prepare samples for SDS-PAGE by adding 2 µl of 6xSB to 20 µg extract (add lysis buffer to a final volume of 12 µl), heat to 80 °C for 10 min.

Purification of virions from cell media

7. Filtrate the supernatant through a 0.45 µm filter.
8. Transfer 1500 µl of virions fraction to an ultracentrifuge tube (swinging rotor).
9. Add 300 µl of fresh sucrose cushion (20% sucrose in TNE) to the bottom of the tube.
10. Centrifuge supernatant at 35000 rpm at 4 °C for 2 hr.
11. Resuspend virion pellet in 50 µl hot 1x sample buffer each (samples 153-1, 2, 3, 187-1, 2, 3). Resuspend VLPs pellet (153-4, 5 and 187 4, 5) in 25 µl hot 1x sample buffer. Vortex shortly, transfer to an eppendorf tube, unite VLPs from wells 153-4+5 and 187- 4+5. Heat to 80 °C for 10 min.
12. Load equal amounts of VLPs relatively to cells extracts amounts.

Western Blot analysis

1. Separate all samples on 12% SDS-PAGE.
2. Transfer samples to nitrocellulose membrane (100V for 1.15 hr).
3. Dye membrane with ponceau solution.
4. Block with 10% low fat milk in TBS-T for 1 hour.
5. Incubate membranes with Goat anti p30 (81S-263) (1:5000) in 10% low fat milk in TBS-T over night at 4 °C. Incubate with secondary antibody rabbit anti goat-HRP 1:8000 for 60 min at room temperature.
6. Detect signal by ECL reaction.
7. Following the ECL detection incubate membranes with Donkey anti rabbit Cy3 (Jackson Laboratories, Cat 711-165-152) 1:500 and detect signal by Typhoon scanning and quantitate.

Results:

As shown in Figure 27, POSH knockdown decreases the release of extracellular MMuLV particles.

5

Example 11. POSH Protein-protein interactions by yeast two hybrid assay

POSH-associated proteins were identified by using a yeast two-hybrid assay.

Procedure:

Bait plasmid (GAL4-BD) was transformed into yeast strain AH109  
10 (Clontech) and transformants were selected on defined media lacking tryptophan. Yeast strain Y187 containing pre-transformed Hela cDNA prey (GAL4-AD) library (Clontech) was mated according to the Clontech protocol with bait containing yeast and plated on defined media lacking tryptophan, leucine, histidine and containing 2 mM 3 amino triazol. Colonies that grew on the selective media were tested for beta-galactosidase activity and positive clones were further characterized. Prey clones  
15 were identified by amplifying cDNA insert and sequencing using vector derived primers.

Bait:

Plasmid vector: pGBK-T7 (Clontech)  
20 Plasmid name: pPL269- pGBK-T7 GAL4 POSHdR  
Protein sequence: Corresponds to aa 53-888 of POSH (RING domain deleted)  
RTLVGSGVEELPSNILLVRLLDGIKQRPWPKPGPGGGSGTNCTNALRSQSSTVANCSSKDL  
QSSQQQQPRVQSWSPPVVRGIPQLPCAKALYNYEKGEPGDLKFSKGDIILRRQVDENWY  
HGEVNGIHINGFFFPTNFVQIKPLPQPPPQCKALYDFEVKDKEADKDCLPFAKDDVLTIVRR  
25 VDENWAEGMLADKIGIFPISYVEFNSAAKQLIEWDKPPVPGVDAGECSSAAAQSSTAPKH  
SDTKKNTKKRHSFTSLTMANKSSQASQNRHSMEISPPVLISSSNPTAAARISELSGLSCS  
APSQVHISTTGLIVTPPPSPVTTGPSFTFPSDVYQAALGTLNPPLPPPPLAATVLAS  
TPPGATAAAAAGMGRPMAGSTDQIAHLRPQTRPSVYVAIYPYTPRKEDEELRKGEMF  
LVFERCQDGWFKGTSMHTSKIGVFPGNVAVPVTAVTNASQAKVPMSTAGQTSRGVTMVS  
30 PSTAGGPAQKLQGNGVAGSPSVVPAAVSAAHIQTSPQAKVLLHMTGQMTVNQARNAVRT  
VAAHNQERPTAAVTPIQVQNAAGLSPASVGLSHHSIASPQPAPLMPGSATHAAISISRA  
SAPLACAAAAPLTSPSITSASLEAEPGRIVTLPGLPTSPDSASSACGNSSATKPDKDS  
KKEKKGLLKLLSGASTKRKPRVSPPASPTLEVELGSAELPLQGAVGPELPPGGGHGRAGS  
CPVGDGPVTTAVAGAALAQDAFHRKASSLDSAVPIAPPRQACSSLGPVLNESRPVVCE  
35 RHRVVVSYPPQSEAELELKEDIVFVHKKREDGWFKGTLQRNGKTGLFPGSFVENI  
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Library screened: Hela pretransformed library (Clontech).

POSH-APs identified by yeast two-hybrid assay are provided in Tables 7 and 8. Also, the nucleic acid and amino acid sequences of POSH-APs identified by yeast two-hybrid assay are provided in Figure 36. In addition, the nucleic acid and 5 amino acid sequences of ARF1 and ARF5 are provided in Figure 36.

Example 12. Inhibition of PKA Kinase Activity Attenuates HIV-1 Virus Maturation

HeLa SS6 cells were transfected with pNLenv-1<sub>PTAP</sub> or pNLenv-1<sub>ATAA</sub> (L-domain mutant). Eighteen hours post-transfection, cells were transferred to 20 °C for 10 two hours in order to inhibit transport of viral particles from the *trans*-Golgi (TGN) to the plasma membrane (PM). Subsequently, the PKA inhibitor, H89 (50 µM) (Biosource, Cat. No. PHZ1114) or DMSO were added to the cells and dishes were transferred to 37 °C to initiate transport from the TGN to the PM. Reverse transcriptase activity was assayed from virus-like-particles collected from cell 15 supernatant twenty minutes later. H89 treatment resulted in complete inhibition of RT activity. Thus, demonstrating that PKA activity is required for HIV-1 viral maturation.

Materials and methods:

20 Cell culture and transfections

Hela SS6 cells were grown in Dulbecco's modified Eagle's medium (DMEM) supplemented with 10% heat-inactivated fetal calf serum and 100 units/ml penicillin and 100 µg/ml streptomycin. For transfections, HeLa SS6 cells were grown to 100% confluency in DMEM containing 10% FCS without antibiotics. 25 Cells were then transfected with HIV-1<sub>NLenv1</sub> (2 µg per 6-well) (Schubert et al., 1995).

Assays for virus release by RT activity

Virus and virus-like particle (VLP) release by reverse transcriptase activity was determined one day after transfection with the pro-viral DNA as previously 30 described (Adachi et al., 1986; Fukumori et al., 2000; Lenardo et al., 2002). The culture medium of virus-expressing cells was collected and centrifuged at 500 x g 9372369\_1

for 10 minutes. The resulting supernatant was passed through a 0.45 µm-pore filter and the filtrate was centrifuged at 14,000 x g for 2 hours at 4 °C. The resulting supernatant was removed and the viral-pellet was re-suspended in cell solubilization buffer (50 mM Tris-HCl, pH7.8, 80 mM potassium chloride, 0.75 mM EDTA and 5 0.5% Triton X-100, 2.5 mM DTT and protease inhibitors). The corresponding cells were washed three times with phosphate-buffered saline (PBS) and then solubilized by incubation on ice for 15 minutes in cell solubilization buffer. The cell detergent extract was then centrifuged for 15 minutes at 14,000 x g at 4 °C. The sample of the cleared extract (normally 1:10 of the initial sample) were resolved on a 12.5% SDS-  
10 polyacrylamide gel, then transferred onto nitrocellulose paper and subjected to immunoblot analysis with rabbit anti-CA antibodies. The CA was detected after incubation with a secondary anti-rabbit antibody conjugated to Cy5 (Jackson Laboratories, West Grove, Pennsylvania) and detected by fluorescence imaging (Typhoon instrument, Molecular Dynamics, Sunnyvale, California). The Pr55 and  
15 CA were then quantified by densitometry. A colorimetric reverse transcriptase assay (Roche Diagnostics GmbH, Mannenheim, Germany) was used to measure reverse transcriptase activity in VLP extracts. RT activity was normalized to amount of Pr55 and CA produced in the cells.

20 Example 13. hPOSH is phosphorylated by Protein kinase A (PKA)

PKA is a cAMP-dependent kinase. The holoenzyme is a tetramer of two catalytic subunits (cPKA) bound to two regulatory subunits PRKR1 or PRKR2. Activation proceeds by the cooperative binding of two cAMP molecules to each R subunit, which causes the dissociation of each active C subunit from the R subunit dimer. The consensus sequence for phosphorylation by the C subunit is, stringently, K/R-R-X-S/TY and less stringently, R-X-X-S/TY, where Y tends to be a hydrophobic residue. The intracellular localization of PKA is controlled thorough association with A-kinase-anchoring proteins (AKAPs). The regulatory subunit of protein kinase A (PRKR1A) was identified as a POSH interactor by yeast-two-hybrid screen, thereby implicating POSH as an AKAP.  
25  
30

Protein kinase A was demonstrated to be required for the budding of transport vesicles from the TGN (Muniz et al., 1997, Proc Natl Acad Sci U S A, 9372369\_1

94:14461-6). Furthermore, it was demonstrated that an inhibitor of PKA, H89, is able to block HIV-1 release from cells (Cartier et al., 2003, J Biol Chem., 278:35211-9). Since POSH is localized at the TGN and is implicated as an AKAP, POSH may regulate PKA-mediated budding at the TGN of vesicles and HIV-1.

5         Applicants demonstrated that POSH is phosphorylated by PKA. Several putative PKA phosphorylation sites are found within hPOSH coding sequence (Figure 30). Phosphorylation of gravin, an AKAP, by PKA modulates its binding to the b2-adrenergic receptor. This serves to regulate the mobilization of gravin and PKA to the cell membrane and regulation of b2-AR activity by PKA. Two putative  
10         PKA sites are located in the putative-rac-binding region in POSH. Toward this end, POSH was subjected to in-vitro phosphorylation and binding to the small GTPase Rac1 (Figure 31). Indeed, only unphosphorylated POSH was able to bind activated, GTP-loaded, Rac1, demonstrating that phosphorylation regulates the binding of POSH to small GTPases, such as Rac1. GTPases of this sort family include TCL,  
15         TC10, Cdc42, Wrch-1, Rac2, Rac3 or RhoG (Aspenstrom et al., 2003, Biochem J., 377(Pt 2):327-37). Small GTPases of this sort are involved in protein trafficking in the secretory system, including the trafficking of viral proteins, such as those of HIV.

#### Materials and methods

##### 20         PKA-dependent phosphorylation of hPOSH.

Bacterially expressed recombinant maltose-binding-protein (MBP)-hPOSH (3 µg) or GST-c-Cbl were incubated at 30oC for 30 minutes with (\*) or without 10 ng PKA catalytic subunit (PKAc) in a buffer containing 40 mM Tris-HCl pH 7.4, 10 mM MgCl<sub>2</sub>, 4 mM ATP, 0.1 mg/ml BSA, 1 µM cAMP, 23 mM K<sub>3</sub>PO<sub>4</sub>, 7 nM DTT, 25 and PKA peptide protection solution (Promega, Cat.No. V5340). The reaction was stopped by the addition of SDS-sample buffer, and boiling for 3 minutes. Samples were separated by SDS-PAGE on a 10% gel, and transferred to nitrocellulose and immunoblotted as detailed in the figure.

##### Binding of Rac1 to hPOSH

Bacterially expressed hPOSH (1 µg) or GST (1 µg) were phosphorylated as above. The reaction was terminated by the addition 0.5 ml of ice-cold 200 mM Tris-HCl pH 7.4, 5 mM EDTA. hPOSH and GST were then immobilized on NiNTA or reduced glutathione beads, respectively, by gentle mixing for 30 minutes. The 5 immobilized proteins were washed three times with wash buffer (50 mM Tris-HCl pH 7.4, 100 mM NaCl, 5 mM MgCl<sub>2</sub>, 0.1 mM DTT). Recombinant Rac-1 (0.2 µg) (Sigma catalog # R3012) was incubated with or without 0.3 mM GTPγS (Sigma Cat. No. G8638) on ice for 15 minutes. The GTP/mock-loaded Rac-1 was then added to wash buffer (25 µl, final) and incubated for 30 minutes at 30 °C. The beads were 10 then washed three times with wash buffer containing 0.1% Tween 20. Sample buffer was added to the bead pellet and boiled for 3 minutes. Immobilized and associating proteins were then separated by SDS-PAGE on a 12% gel and immunoblotted with anti-Rac-1 (Santa Cruz Biotechnology, Cat. No. sc-217). Input is 0.25 µg of Rac-1.

15 Example 14. HERPUD1 Depletion by siRNA Reduces HIV Maturation.

Hela SS6 cells were transfeted with siRNA directed against HERPUD1 and with a plsmid encoding HIV proviral genome (pNLenv-1). Twenty four hours post-HIV transfection, virus-like particles (VLP) secreted into the medium were isolated and reverse transcriptase activity was determined. HIV release of active RT is an 20 indication for a release of processed and mature virus. When the levels of HERPUD1 were reduced RT activity was inhibited by 80%, demonstrating the importance of HERPUD1 in HIV-maturation. See Figure 33.

Experimental Outline

- Cell culture and transfection:

25 HeLa SS6 were kindly provided by Dr. Thomas Tuschl (the laboratory of RNA Molecular Biology, Rockefeller University, New York, New York). Cells were grown in Dulbecco's modified Eagle's medium (DMEM) supplemented with 10% heat-inactivated fetal calf serum and 100 U/ml penicillin and 100 µg/ml streptomycin. For transfections, HeLa SS6 cells were grown to 50% confluence in 30 DMEM containing 10% FCS without antibiotics. Cells were then transfected with the relevant double-stranded siRNA (50-100nM) (HERPUD1: 5'-GGGAAGUUCUUCGGAACCUDdT-3' and 5'-

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dTdTCCCCUCAAGAACCUUGGA-5') using lipofectamin 2000 (Invitrogen, Paisley, UK). A day following the initial transfection cells were split 1:3 in complete medium and co-transfected 24 hours later with HIV-1NLenv1 (2 µg per 6-well) (Schubert et al., J. Virol. 72:2280-88 (1998)) and a second portion of double-stranded siRNA.

5           • Assay for virus release

Virus and virus-like particle (VLP) release was determined one day after transfection with the proviral DNA as previously described (Adachi et al., J. Virol. 59: 284-91 (1986); Fukumori et al., Vpr. Microbes Infect. 2: 1011-17 (2000); 10 Lenardo et al., J. Virol. 76: 5082-93 (2002)). The culture medium of virus-expressing cells was collected and centrifuged at 500 x g for 10 minutes. The resulting supernatant was passed through a 0.45µm-pore filter and the filtrate was centrifuged at 14,000 x g for 2 hours at 4°C. The resulting supernatant was removed and the viral-pellet was re-suspended in SDS-PAGE sample buffer. The 15 corresponding cells were washed three times with phosphate-buffered saline (PBS) and then solubilized by incubation on ice for 15 minutes in lysis buffer containing the following components: 50 mM HEPES-NaOH, (pH 7.5), 150 mM NaCl, 1.5 mM MgCl<sub>2</sub>, 0.5% NP-40, 0.5% sodium deoxycholate, 1 mM EDTA, 1 mM EGTA and 1:200 dilution of protease inhibitor cocktail (Calbiochem, La Jolla, California). The 20 cell detergent extract was then centrifuged for 15 minutes at 14,000 x g at 4°C. The VLP sample and a sample of the cleared extract (normally 1:10 of the initial sample) were resolved on a 12.5% SDS-polyacrylamide gel, then transferred onto nitrocellulose paper and subjected to immunoblot analysis with rabbit anti-CA antibodies. The CA was detected either after incubation with a secondary anti-rabbit 25 horseradish peroxidase-conjugated antibody and detected by Enhanced Chemi-Luminescence (ECL) (Amersham Pharmacia) or after incubation with a secondary anti-rabbit antibody conjugated to Cy5 (Jackson Laboratories, West Grove, Pennsylvania) and detected by fluorescence imaging (Typhoon instrument, Molecular Dynamics, Sunnyvale, CA). The Pr55 and CA were then quantified by 30 densitometry and the amount of released VLP was then determined by calculating the ratio between VLP-associated CA and intracellular CA and Pr55 as previously described (Schubert et al., J. Virol. 72:2280-88 (1998)).

- Analysis of reverse transcriptase activity in supernatants

RT activity was determined in pelleted VLP (see above) by using an RT assay kit (Roche, Germany; Cat.No. 1468120). Briefly, VLP pellets were resuspended in 40 µl RT assay lysis buffer and incubated at room temperature for 30 minutes. At the end of incubation 20 µl RT assay reaction mix was added to each sample and incubation continued at 37°C overnight. Samples (60 µl) were then transferred to MTP strip wells and incubated at 37°C for 1 hour. Wells were washed five times with wash buffer and DIG-POD added for a one-hour incubation at 37°C. At the end of incubation wells were washed five times with wash buffer and ABST substrate solution was added and incubated until color developed. The absorbance was read in an ELISA reader at 405 nm (reference wavelength 492 nm). The resulting signal intensity is directly proportional to RT activity; RT concentration was determined by plotting against a known amount of RT enzyme included in separate wells of the reaction.

15

Example 15. MSTP028 Reduction by siRNA Decreases HIV VLP Production.

This example demonstrates the effects of an siRNA-mediated decrease in MSTP028 expression on the production of HIV virus-like particles in HeLa cells. The effects were measured at steady state.

20

Experiments were performed according to two different protocols. Experiment 1 proceeded with a second transfection on day 3, while Experiment 2 involved an additional exchange of medium on day 3, and proceeded to the second transfection on day 4. The results from Experiment 1 are shown Figure 29A, and those for Experiment 2 are shown in Figure 29B.

25

Day 1: Preparing Cells

4.5X10<sup>5</sup> HeLa SS6 cells/well, were seeded in 1 x 6 well plates. Cells were seeded in transfection medium (growing medium free of antibiotics).

30

Materials:

Cat. No.	Manufacture	Reagent Name
----------	-------------	--------------

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D5796	Sigma	DMEM
04-121-1A	Beit Haemek	FCS
D8537	Sigma	PBS
P4333	Sigma	Pen/Strep
5 T4049	Sigma	0.25% Trypsin-EDTA

Day 2: Transfection

Materials:

10	Cat. No.	Manufacture	Reagent Name
	11668-027	Invitrogen	LF2000 reagent
	31985-047	GibcoBRL	OptiMEM

MSTP028 RNAi constructs:

		siRNA target sequence	Accession	Pos.
15	MST028	AAGTGCTCACCGACAGTGAAG	NM_031954	197
	MST028	AAGATACTTATGAGCCTTCT	NM_031954	392

Experimental and Control Conditions:

- 20 1- Control siRNA+ pNLenv-1  
2- POSH siRNA + pNLenv-1  
3- MSTP028 siRNA + pNLenv-1

1. Two hours before transfection, replace cell media to 2ml/well complete  
25 DMEM without antibiotics.  
2. siRNA dilution: for each transfection dilute 100 nm siRNA in 0.25 ml  
OptiMEM per well.  
3. LF 2000 dilution: for each well dilute 5µl lipofectamine reagent in 0.25ml  
OptiMEM.  
30 4. Incubate diluted siRNAs and LF 2000 for 5 minutes at RT.  
5. Mix the diluted siRNAs with diluted LF2000 and incubated for 25 minutes at  
RT.

6. Add the mixture to the cells, 0.5 ml/well (drop wise) and incubate for 24 hours at 37°C in CO<sub>2</sub> incubator.

Transfections: for each well

- 5 (12.5 µl (siRNA)/ 0.25 ml OptiMEM) x 3  
LF 2000 35 µl / 1.75 ml

Day 3:

- 10 Exp. 1: second transfection (as Day 4 below).  
Exp. 2: Exchange medium.

Day 4:

- 15 Exp. 1: VLP assay (see below).  
Exp. 2: Second transfection

1. Two hours before transfection, replace cell media to 2ml/well complete DMEM without antibiotics.
- 20 2. siRNA and DNA dilution: Prepare dilution of plasmid pNLenv-1 0.75 µg / well in 0.25 ml OptiMEM (total of 3 wells). Divide plasmid dilution to eppendorf tubes (0.25 ml each). To each tube add siRNA 40nM (2.5 µl).
3. LF 2000 dilution: for each well dilute 5µl lipofectamine reagent in 0.25ml OptiMEM.
- 25 4. Incubate diluted siRNAs and LF 2000 for 5 minutes at RT.
5. Mix the diluted siRNAs with diluted LF2000 and incubated for 1 hour at RT.
6. Add the mixture to the cells, 0.5 ml/well (drop wise) and incubate for 24 hours at 37°C in CO<sub>2</sub> incubator.

30 Day 5:

Exp. 2: VLP assay.

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Solutions:

Lysis buffer

Tris-HCl pH 7.6      50mM

5    MgCl<sub>2</sub>                  1.5mM

NaCl                  150mM

Glycerol                  10%

NP-40                  0.5%

DOC                  0.5%

10    EDTA                  1mM

EGTA                  1mM

Add PI<sub>3</sub>C 1:200.

Steady state VLP assay

15    A. Cell extracts

1.    Pellet floating cells by centrifugation (1min, 14000rpm at 40C), save supernatant (continue with supernatant immediately to step B), scrape cells in ice-cold PBS, add to the corresponding floated cell pellet and centrifuge for 5min 1800rpm at 40C.

20    2.    Wash cell pellet once with ice-cold PBS.

3.    Resuspend cell pellet (from 6 well) in 100 µl NP40-DOC lysis buffer and incubate 10 minutes on ice.

4.    Centrifuge at 14,000rpm for 15min. Transfer supernatant to a clean eppendorf.

25    5.    Prepare samples for SDS-PAGE by adding them sample buffer and boil for 10min - take the same volume for each reaction (15 µl).

B. Purification of VLP from cell media

1.    Filtrate the supernatant through a 0.45µm filter.

30    2.    Centrifuge supernatant at 14,000rpm at 40C for at least 2h.

3.    Resuspend VLP pellet in 50 µl 1X sample buffer and boil for 10 min. Load 25 µl of each sample.

C. Western Blot analysis

1. Run all samples from stages A and B on Tris-Gly SDS-PAGE 12.5%.
2. Transfer samples to nitrocellulose membrane (100V for 1.15h.).
- 5 3. Dye membrane with ponceau solution.
4. Block with 10% low fat milk in TBS-t for 1h.
5. Incubate with anti p24 rabbit 1:500 in TBS-t 2 hour (room temperature) - overnight (40C).
6. Wash 3 times with TBS-t for 7min each wash.
- 10 7. Incubate with secondary antibody anti rabbit cy5 1:500 for 30min.
8. Wash five times for 10min in TBS-t
9. View in Typhoon for fluorescence signal (650).

Example 16. POSH-depleted cells have lower levels of Herp and it is not  
15 monoubiquitinated

POSH-depleted cells and their control counterparts were lysed and immunoblotted with anti-herp antibodies. Cells depleted of POSH (H153 RNAi stables cell lines) cells have lower levels of Herp compared with control cells (H187 RNAi) (Figure 34A panel A). When cells were transnected with a plasmid encoding 20 flagged-tagged ubiquitin, and immunoprecipitated with anti-flag antibodies to immunoprecipitate ubiquitinated proteins, Herp was ubiquitinated only in H187 cells and not in H153 cells (Figure 34A panel B). When the aforementioned cells were transfected with Herp-encoding plasmid, exogenous herp levels were also reduced in H153 cells compared to H187 cells (Figure 34B panel A) and the ubiquitination of 25 exogenous herp was reduced in the former cells, similar to endogenous Herp. The molecular weight of ubiquitinated Herp is as predicated to full-length Herp and does not seem as a high molecular weight smear, a characteristic of polyubiquitinated proteins. Thus POSH is responsible for the mono-ubiquitination of Herp, and in the absence of this modification herp is subjected to degradation, which may be 30 mediated by the proteosome.

Materials and methods

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**Plasmid generation**

Full-length Herp was cloned from image clone MGC:45131 IMAGE:5575914 (GeneBank Accesion BC032673) into pCMV-SPORT6.

5

**Antibody production**

Herp1 (amino acids 1 to 251) was amplified from a plasmid (3Gd4) obtained by yeast two hybrid screen for interactors of POSH. The amplified open reading frame was cloned into pGEX-6P, expressed in E. coli BL21 by induction with 1 mM IPTG 10 and purified on glutathione-agarose. The purified protein was cleaved with Precision™ protease (Amersham Biosciences) and the GST moiety removed by glutathione chromatography. The protein was injected into rabbits (Washington Biotechnology) to produce anti-Herp1 sera.

15 **Transfections and antibody detection**

Twenty-four hours prior to transfection POSH-RNAi clones (H153) or control-RNAi clones (H187) cells were plated in 10 cm dishes in growth medium (DMEM containing 10% fetal calf serum without antibiotics). Cells were transfected with 20 lipofectamin 2000 (Invitrogen Corporation) and either Herp-expression plasmid (2.5 µg) or empty vector (2.5 µg) and a vector encoding Flag-tagged ubiquitin (1 µg). Twenty-four hours post-trasnfection cells were lysed in lysis buffer (50 mM Tris-HCl, pH7.6, 1.5 mM MgCl<sub>2</sub>, 150 mM NaCL, 10% glycerol, 1 mM EDTA, 1 mM EGTA, 0.5% NP-40 and 0.5% sodium deoxycholate, containing protease inhibitors) and subjected to immunoprecipitation with anti-Flag antibodies (Sigma, F7425) to 25 precipitate ubiquitinated proteins. Immunoprecipitated material and total cell lysates were separated on 10% SDS-PAGE and transferred to nitrocellulose membranes which were immunoblotted with anti-Herp antibodies.

**Generation of H187 and H153 cell lines**

To relieve the necessity for multiple transfections and to improve the reproducibility of hPOSH reduction, we have generated two cell lines, H187 and H153 constitutively expressing an integrated control and hPOSH siRNA (respectively).

**Construction of shRNA retroviral vectors- hPOSH scrambled oligonucleotide (5'-**

5 CACACACTGCCGTCAACTGTTCAAGAGACAGTTGACGGCAGTGTGTGTTT TTT-3'; and 5'-AATTAAAAAACACACACTGCCGTCAACTGTCTCTGAACA

10 and blunted by end filling. The insert was cloned into the OliI site in the retroviral vector, pMSCVhyg (BD Biosciences Clontech), generating pMSCVhyg-U6-

**Recombinant retrovirus production-** HEK 293T cells were transfected with retroviral RNAi plasmids (pMSCVhyg-U6-POSH-230 and pMSCVhyg-U6-scrambled and with plasmids encoding VSV-G and Moloney Gag-pol. Two days post-transfection, the retrovirus-containing medium was collected and filtered.

5   **Infection and selection-** Polybrene (Hexadimethrine bromide) (Sigma) (8 $\mu$ g/ml) was added to the filtered and the treated medium was subsequently used to infect HeLa SS6 cells. Forty-eight hours post-infection clones were selected for RNAi expression by the addition of hygromycin (300  $\mu$ g/ml). Clones expressing the scrambled and the hPOSH RNAi were termed H187 and H153 (respectively).

10   **Example 17. Inhibition of HBV production**

HepG2.2.15 cells were plated on 9cm dishes and allowed to grow in 8% FCS for 5 days up to 70% confluence. After 5 days, cells were washed twice with PBS and re-supplied with fresh DMEM without FCS. In this medium, cells were treated every 24 hours with the depicted solutions (3 $\mu$ l solution/1ml medium) for another 4 15 days (4 treatments total). After 4 days, medium was collected from each plate, viruses were sedimented and analyzed.

As shown in Figure 35, lanes 7 and 8, compounds CAS number 14567-55-4 and CAS number 414908-38-0 inhibit HBV production at a concentration of 3 $\mu$ M. Detection of HBV proteins was performed essentially as described in Paran, N et al 20 (2001) EMBO J 20(16):4443-4453.

**INCORPORATION BY REFERENCE**

All publications and patents mentioned herein are hereby incorporated by reference in their entirety as if each individual publication or patent was specifically and individually indicated to be incorporated by reference. In case of conflict, the present application, including any definitions herein, will control.

## EQUIVALENTS

While specific embodiments of the subject applications have been discussed, the above specification is illustrative and not restrictive. Many variations of the 5 applications will become apparent to those skilled in the art upon review of this specification and the claims below. The full scope of the applications should be determined by reference to the claims, along with their full scope of equivalents, and the specification, along with such variations.

10

PCT/US04/06308

UNITED STATES PATENT AND TRADEMARK OFFICE  
DOCUMENT CLASSIFICATION BARCODE SHEET



New International  
Application

Claim(s)

7

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Index 1.1.5.2  
Version 1.0  
Rev 12/06/01

Section

**What Is Claimed:**

1. An isolated, purified or recombinant complex comprising a POSH polypeptide and a POSH-associated protein (POSH-AP).
2. The complex of claim 1, wherein the POSH-AP comprises a polypeptide selected from the group consisting of: PKA, SNX1, SNX3, ATP6V0C, PTPN12, PPP1CA, GOSR2, CENTB1, DDEF1, ARF1, ARF5, PACS-1, EPS8L2, HERPUD1, UNC84B, MSTP028, GOCAP, EIF3S3, SRA1, CBL-B, RALA, SIAH1, SMN1, SMN2, SYNE1, TTC3, VCY2IP1 and UBE2N (UBC13).
3. The complex of claim 1, wherein the POSH-AP comprises a polypeptide selected from the group consisting of: ARHV (Chp), WASF1, HIP55, SPG20, HLA-A, and HLA-B.
4. The complex of any one of claims 1-3, wherein the POSH polypeptide is a human POSH polypeptide.
5. An isolated, purified or recombinant complex comprising HERPUD1 and a Ubiquitin ligase.
6. The complex of claim 5, wherein the Ubiquitin ligase is selected from the group consisting of: POSH, CBL-B, TTC3, and SIAH1.
7. A method for identifying an agent that modulates an activity of a POSH polypeptide or POSH-AP, the method comprising identifying an agent that disrupts a complex of any one of claims 1-3, wherein an agent that disrupts a complex of any of claims 1-3 is an agent that modulates an activity of the POSH polypeptide or the POSH-AP.
8. A method of identifying an antiviral agent, comprising:
  - (a) identifying a test agent that disrupts a complex comprising a POSH polypeptide and a POSH-AP; and

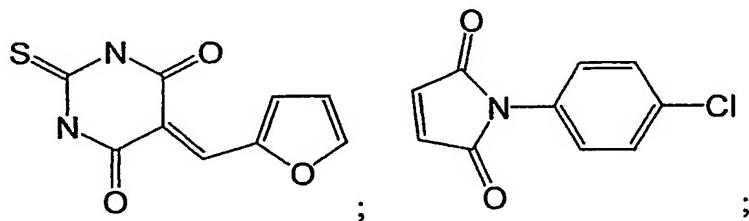
- (b) evaluating the effect of the test agent on a function of a virus,  
wherein an agent that inhibits a pro-infective or pro-replicative function of a  
virus is an antiviral agent.
9. The method of claim 8, wherein the POSH-AP is selected from the group  
5 consisting of: PKA, SNX1, SNX3, PTPN12, GOSR2, CENTB1, ARF1,  
ARF5, PACS-1, EPS8L2, HERPUD1, SMN1, SMN2, UNC84B, MSTP028,  
GOCAP, CBL-B, SYNE1, UBE2N (UBC13), SIAH1, TTC3, WASF1,  
HIP55, RALA, and SPG20.
10. The method of claim 8, wherein the virus is an envelope virus.
- 10 11. The method of claim 8, wherein the virus is a Human Immunodeficiency  
Virus.
12. The method of claim 8, wherein the virus is a West Nile Virus.
13. The method of claim 8, wherein the virus is Moloney Murine Leukemia  
Virus (MMuLV).
- 15 14. The method of claim 8, wherein evaluating the effect of the test agent on a  
function of the virus comprises evaluating the effect of the test agent on the  
budding or release of the virus or a virus-like particle.
15. A method of identifying an anti-apoptotic agent, comprising:  
20 (a) identifying a test agent that disrupts a complex comprising a POSH  
polypeptide and a POSH-AP; and  
(b) evaluating the effect of the test agent on apoptosis of a cell,  
wherein an agent that decreases apoptosis of the cell is an anti-apoptotic  
agent.
16. A method of identifying an anti-cancer agent, comprising:

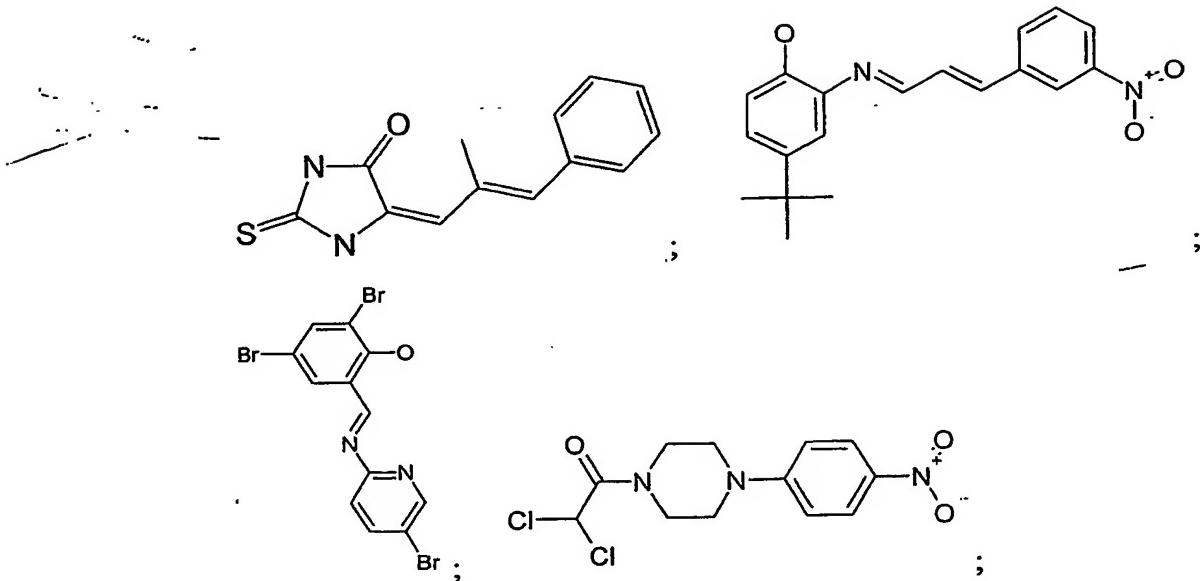
- (a) identifying a test agent that disrupts a complex comprising a POSH polypeptide and a POSH-AP; and
  - (b) evaluating the effect of the test agent on proliferation or survival of a cancer cell,
- 5 wherein an agent that decreases proliferation or survival of a cancer cell is an anti-cancer cell.
17. The method of claim 16, wherein the POSH-AP is selected from the group consisting of: PKA, SNX1, PTPN12, PPP1CA, ARF1, ARF5, CENTB1, EPS8L2, EIF3S3, CBL-B, RALA, SIAH1, TTC3, ATP6V0C, and VCY2IP1.
- 10 18. The method of claim 16, wherein the cancer cell is a cell derived from a POSH-associated cancer.
19. A method of identifying an agent that inhibits trafficking of a protein through the secretory pathway, comprising:
  - (a) identifying a test agent that disrupts a complex comprising a POSH polypeptide and a POSH-AP; and
  - (b) evaluating the effect of the test agent on the trafficking of a protein through the secretory pathwaywherein an agent that disrupts localization of said POSH-AP is an agent that inhibits trafficking of a protein through the secretory pathway.
- 20 20. The method of claim 19, wherein step (b) comprises evaluating the effect of the test agent on the trafficking of a myristoylated protein through the secretory pathway.
21. The method of claim 19, wherein step (b) comprises evaluating the effect of the test agent on the trafficking of a viral protein through the secretory pathway.
- 25

22. The method of claim 19, wherein (b) comprises evaluating the effect of the test agent on the trafficking of a protein associated with a neurological disorder through the secretory pathway.
23. The method of claim 22, wherein the protein associated with a neurological disorder is amyloid beta precursor protein.  
5
24. A method of identifying an agent that inhibits the progression of a neurological disorder, comprising:
  - (a) identifying a test agent that disrupts a complex comprising a POSH polypeptide and a POSH-AP; and
  - (b) evaluating the effect of the test agent on the trafficking of a protein through the secretory pathway  
10  
wherein an agent that disrupts localization of a POSH-AP is an agent that inhibits progression of a neurological disorder.
25. The method of claim 24, wherein the POSH-AP is selected from the group consisting of: HERPUD1, CBL-B, SIAH1, and TTC3.  
15
26. The method of claim 25, wherein the POSH-AP is HERPUD1.
27. A method of identifying an agent that inhibits the progression of a neurological disorder, comprising:
  - (a) identifying a test agent that disrupts a complex comprising a POSH polypeptide and a POSH-AP; and  
20
  - (b) evaluating the effect of the test agent on the ubiquitination of a protein.
28. The method of claim 27, wherein the POSH-AP is HERPUD1.

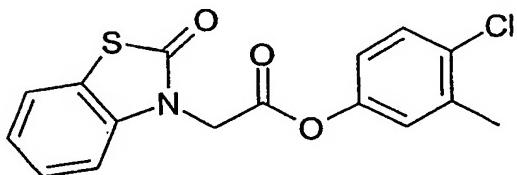
29. A method of treating a viral infection in a subject in need thereof, comprising administering an agent that inhibits a POSH-AP in an amount sufficient to inhibit the viral infection.
30. The method of claim 29, wherein the agent is selected from the group consisting of:
  - i) an agent that inhibits a kinase activity of the POSH-AP;
  - ii) an agent that inhibits expression of the POSH-AP;
  - iii) an agent that inhibits the ubiquitin ligase activity of the POSH-AP;
  - iv) an agent that inhibits the phosphatase activity of the POSH-AP;
  - v) an agent that inhibits the GTPase activity of the POSH-AP; and
  - vi) an agent that inhibits the ubiquitination of the POSH-AP.
31. The method of claim 29, wherein the POSH-AP comprises a polypeptide selected from the group consisting of: PKA, SNX1, SNX3, SMN1, SMN2, PTPN12, GOSR2, CENTB1, ARF1, ARF5, PACS-1, EPS8L2, HERPUD1, UNC84B, MSTP028, GOCAP, CBL-B, SYNE1, UBE2N (UBC13), SIAH1, TTC3, WASF1, HIP55, RALA, and SPG20.
32. The method of claim 31, wherein the POSH-AP comprises a polypeptide selected from the group consisting of: PKA, HERPUD1, MSTP028, CBL-B, and UBE2N (UBC13).
33. The method of claim 32, wherein said agent is selected from the group consisting of: an siRNA construct, a small molecule, an antibody, and an antisense construct.
34. The method of claim 33, wherein the agent is an siRNA construct comprising a nucleic acid sequence that hybridizes to an mRNA encoding the POSH-AP.

35. The method of claim 34, wherein the agent is an siRNA construct or an antisense construct that inhibits the expression of a polypeptide selected from the group consisting of PKA, HERPUD1, MSTP028, CBL-B, and UBE2N (UBC13).
- 5 36. The method of claim 35, wherein the agent is an siRNA construct or an antisense construct that inhibits the expression of HERPUD1 or MSTP028.
37. The method of claim 36, wherein the siRNA construct inhibits the expression of MSTP028.
- 10 38. The method of claim 36, wherein the siRNA construct inhibits the expression of HERPUD1 and is selected from the group consisting of: 5'-GGGAAGUUCUUCGGAACCUdTdT-3' and 5'-dTdTCCCCUUCAAGAACCCUUGGA-5'.
- 15 39. The method of claim 33, wherein the small molecule inhibitor is selected from among the following categories: adenosine cyclic monophosphorothioate, isoquinolinesulfonamide, piperazine, piceatannol, and ellagic acid.
40. The method of claim 33, wherein the small molecule is selected from among:





5 and



41. The method of claim 23, wherein the small molecule inhibits the ubiquitination of a POSH-AP.
- 10 42. The method of claim 29, wherein the subject is infected with an envelope virus.
43. The method of claim 42, wherein the envelope virus is an HIV.
44. The method of claim 42, wherein the envelope virus is a WNV.
45. The method of claim 29, wherein the virus is a MMuLV.

46. Use of a protein kinase A inhibitor for the manufacture of a medicament for treatment of a viral infection.
47. Use of an inhibitor of HERPUD1 for the manufacture of a medicament for treatment of a viral infection.
- 5 48. Use of an inhibitor of MSTP028 for the manufacture of a medicament for treatment of a viral infection.
49. A packaged pharmaceutical for use in treating a viral infection, comprising:
  - (a) a pharmaceutical composition comprising an inhibitor of a POSH-AP and a pharmaceutically acceptable carrier; and
  - 10 (b) instructions for use.
50. The packaged pharmaceutical of claim 49, wherein the viral infection is caused by an envelope virus.
51. A method for identifying an antiviral agent comprising:
  - (a) identifying a test agent that inhibits an activity of or expression of a POSH-AP; and
  - 15 (b) evaluating an effect of the test agent on a function of a virus.
52. A method of evaluating an antiviral agent comprising:
  - (a) providing a test agent that inhibits an activity of or expression of a POSH-AP; and
  - 20 (b) evaluating an effect of the test agent on a function of a virus.
53. The method of claim 51 or 52, wherein the virus is an envelope virus.
54. The method of claim 51 or 52, wherein the virus is a Human Immunodeficiency Virus.

55. The method of claim 51 or 52, wherein the virus is a West Nile Virus.
56. The method of claim 51 or 52, wherein the virus is a MMuLV.
57. The method of claim 51 or 52, wherein evaluating the effect of the test agent on a function of the virus comprises evaluating the effect of the test agent on the budding or release of the virus or a virus-like particle.
58. The method of claim 51 or 52, wherein the POSH-AP is selected from the group consisting of: PKA, SNX1, SNX3, PTPN12, GOSR2, SMN1, SMN2, CENTB1, ARF1, ARF5, PACS-1, EPS8L2, HERPUD1, UNC84B, MSTP028, GOCAP, CBL-B, SYNE1, UBE2N (UBC13), SIAH1, TTC3, WASF1, HIP55, RALA, and SPG20.
- 10 59. The method of claim 58, wherein the POSH-AP is HERPUD1.
60. The method of claim 58, wherein the POSH-AP is MSTP028.
61. The method of claim 51 or 52, wherein the test agent is selected from among: an antisense nucleic acid, an siRNA construct, a small molecule, an antibody and a polypeptide.
- 15 62. The method of claim 61, wherein the siRNA construct inhibits the expression of HERPUD1 and is selected from the group consisting of: 5'-GGGAAGUUCUUCGGAACCUdTdT-3' and 5'-dTdTCCCUUCAAGAACGCCUUGGA-5'.
- 20 63. A method of identifying an agent that modulates a POSH function, comprising:
  - a) identifying an agent that modulates a POSH-AP; and
  - b) testing the effect of the agent on a POSH function.
64. A method of evaluating an agent that modulates a POSH function, comprising:

- a) providing an agent that modulates a POSH-AP; and
  - b) testing the effect of the agent on a POSH function.
65. The method of claim 64 or 65, wherein the POSH-AP comprises a polypeptide selected from the group consisting of: PKA, SNX1, SNX3, ATP6V0C, PTPN12, PPP1CA, GOSR2, CENTB1, DDEF1, ARF1, ARF5, PACS-1, EPS8L2, HERPUD1, UNC84B, MSTP028, GOCAP, EIF3S3, SRA1, CBL-B, RALA, SIAH1, SMN1, SMN2, SYNE1, TTC3, VCY2IP1 and UBE2N (UBC13).
66. The method of claim 64 or 65, wherein the POSH-AP comprises a polypeptide selected from the group consisting of: ARHV (Chp), WASF1, HIP55, SPG20, HLA-A, and HLA-B.
67. The method of claim 64 or 65, wherein testing the effect of the agent on a POSH function comprises testing the effect of the agent on the production of viral particles or virus like particles in a cell infected with an envelope virus.
68. The method of claim 64 or 65, wherein testing the effect of the agent on a POSH function comprises testing the effect of the agent on a POSH enzymatic activity.
69. The method of claim 68, wherein the POSH enzymatic activity is ubiquitin ligase activity.
70. The method of claim 64 or 65, wherein testing the effect of the agent on a POSH function comprises testing the effect of the agent on POSH-mediated localization or secretion of a protein.
71. The method of claim 64 or 65, wherein testing the effect of the agent on a POSH function comprises testing the effect of the agent on the interaction of POSH with a POSH-AP.
72. The method of claim 71, wherein the POSH-AP is a small GTPase.

73. The method of claim 72, wherein the small GTPase is selected from the group consisting of: ARF1, ARF5, and RALA.
74. The method of claim 64 or 65, wherein the test agent is selected from among: an antisense nucleic acid, an siRNA construct, a small molecule, an antibody and a polypeptide.  
5
75. A method of identifying an agent that modulates a HERPUD1 function, comprising:
  - a) identifying an agent that modulates POSH; and
  - b) testing the effect of the agent on a HERPUD1 function.
- 10 76. A method of evaluating an agent that modulates an HERPUD1 function; comprising:
  - a) providing an agent that modulates POSH; and
  - b) testing the effect of the agent on a HERPUD1 function.
77. The method of claim 75 or 76, wherein testing the effect of the agent on a  
15 HERPUD1 function comprises contacting a cell with the agent and measuring the effect of the agent on ubiquitination of HERPUD1 in the cell.
- 20 78. A method of treating a viral infection in a subject in need thereof, comprising administering an agent that inhibits MSTP028 in an amount sufficient to inhibit viral infection.
79. The method of claim 78, wherein said agent is selected from the group consisting of: an siRNA construct, a small molecule, an antibody, and an antisense construct.
- 25 80. The method of claim 79, wherein the agent is an siRNA construct comprising a nucleic acid sequence that hybridizes to an mRNA encoding the MSTP028.

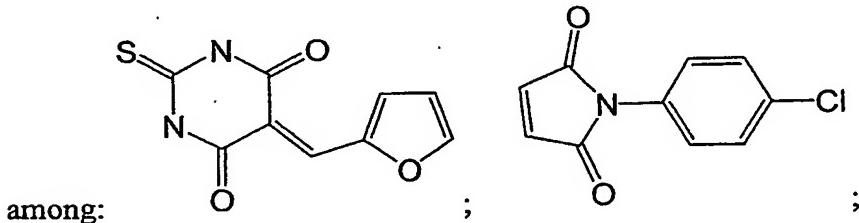
81. A method of inhibiting an activity of a POSH-AP in a cell, comprising contacting the cell with an inhibitor of POSH.
82. The method of claim 81, wherein the POSH-AP comprises a polypeptide selected from the group consisting of: PKA, SNX1, SNX3, ATP6V0C, PTPN12, PPP1CA, GOSR2, CENTB1, DDEF1, ARF1, ARF5, PACS-1, EPS8L2, HERPUD1, UNC84B, MSTP028, GOCAP, EIF3S3, SRA1, CBL-B, RALA, SIAH1, SMN1, SMN2, SYNE1, TTC3, VCY2IP1 and UBE2N (UBC13).  
5
83. The method of claim 81, wherein the inhibitor of POSH is selected from among the following:  
10
  - i) an agent that inhibits a POSH activity; and
  - ii) an agent that inhibits expression of a POSH.
84. The method of claim 83, wherein the POSH activity is ubiquitin ligase activity.  
15
85. A method of treating a POSH-associated disease in a subject, comprising administering a POSH-AP inhibitor to a subject in need thereof.  
86. The method of claim 85, wherein said POSH-AP inhibitor is an agent selected from the group consisting of:  
20
  - i) an agent that inhibits a kinase activity of the POSH-AP;
  - ii) an agent that inhibits expression of the POSH-AP;
  - iii) an agent that inhibits the ubiquitin ligase activity of the POSH-AP;
  - iv) an agent that inhibits the phosphatase activity of the POSH-AP;
  - v) an agent that inhibits the GTPase activity of the POSH-AP; and
  - vi) an agent that inhibits the ubiquitination of the POSH-AP.

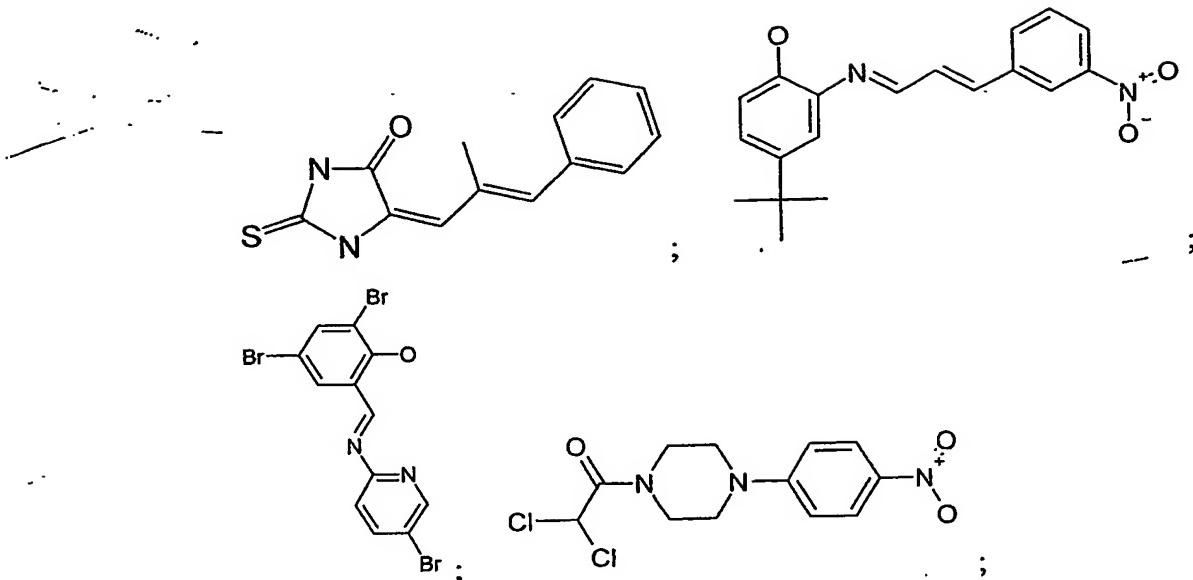
87. The method of claim 85, wherein the POSH-associated disease is a viral infection.
88. The method of claim 85, wherein the POSH-associated disease is a POSH-associated cancer.
- 5 89. The method of claim 85, wherein the POSH-associated disease is a POSH-associated neurological disorder.
90. A method of identifying an anti-viral agent, comprising:
  - a) forming a mixture comprising a POSH polypeptide, a POSH-AP and a test agent; and
  - 10 b) detecting phosphorylation of the POSH polypeptide, wherein an agent that inhibits phosphorylation of POSH is an anti-viral agent.
91. A method of identifying an anti-viral agent, comprising:
  - a) forming a mixture comprising a POSH polypeptide, a POSH-AP, ubiquitin and a test agent; and
  - 15 b) detecting ubiquitination of the POSH-AP, wherein an agent that inhibits ubiquitination of the POSH-AP is an anti-viral agent.
92. The method of claim 91, wherein the POSH-AP is HERPUD1.
- 20 93. A method of identifying a modulator of POSH, comprising:
  - a) forming a mixture comprising a POSH polypeptide, a POSH-AP and a test agent; and
  - b) detecting phosphorylation of the POSH polypeptide,

wherein an agent that alters phosphorylation of POSH is an agent that modulates POSH.

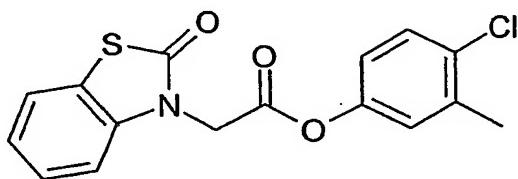
94. A method of identifying a modulator of POSH, comprising:
- a) forming a mixture comprising a POSH polypeptide, a POSH-AP, ubiquitin and a test agent; and
  - b) detecting ubiquitination of the POSH-AP,
- wherein an agent that inhibits ubiquitination of the POSH-AP is an agent that modulates POSH.
95. The method of claim 91, wherein the POSH-AP is HERPUD1.
- 10 96. A method of treating or preventing a POSH associated cancer in a subject comprising administering an agent that inhibits a POSH-AP to a subject in need thereof, wherein said agent treats or prevents cancer.
97. The method of claim 96, wherein the POSH-AP comprises a polypeptide selected from the group consisting of: PKA, SNX1, PTPN12, PPP1CA, CENTB1, ARF1, ARF5, EPS8L2, EIF3S3, CBL-B, RALA, SIAH1, TTC3, ATPV0C, and VCY2IP1.
- 15 98. The method of claim 96, wherein the cancer is associated with increased POSH expression.
99. A method of treating or preventing a POSH-associated neurological disorder in a subject comprising administering an agent that inhibits a POSH-AP to a subject in need thereof, wherein said agent treats or prevents the neurological disorder.
- 20 100. The method of claim 99, wherein the POSH-AP comprises a polypeptide selected from the group consisting of: PTPN12, DDEF1, EPS8L2, HERPUD1, GOCAP, CBL-B, SIAH1, SMN1, SMN2, TTC3, SPG20, SNX1, and ARF1.

101. A method of treating a neurological disorder comprising administering an agent to a subject in need thereof, wherein said agent, inhibits the ubiquitin ligase activity of POSH.
102. A method of treating a neurological disorder comprising administering an agent to a subject in need thereof, wherein said agent inhibits the ubiquitination of a POSH-AP.  
5
103. The method of claim 101 or claim 102, wherein the neurological disorder is selected from among: Alzheimer's disease, Parkinson's disease, Huntington's disease, schizophrenia, Niemann-Pick's disease, and prion-associated diseases.  
10
104. The use of an agent of claim 103, wherein the neurological disorder is Alzheimer's disease.
105. The method of claim 101 or claim 102, wherein said agent is selected from the group consisting of: an siRNA construct, a small molecule, an antibody, and an antisense construct.  
15
106. The method of claim 105, wherein the small molecule is selected from





5 and



107. The method of claim 102, wherein the POSH-AP is HERPUD1.
108. The method of claim 61, wherein the siRNA construct inhibits the expression of MSTP028 and is selected from the group consisting of: 5'-AAGTGCTCACCGACAGTGAAG-3' and 5'-AAGATACTTATGAGCCTTCT-3'.

15

POSH INTERACTING PROTEINS AND RELATED METHODS

ABSTRACT

5       The application provides novel complexes of POSH polypeptides and POSH-associated proteins. The application also provides methods and compositions for treating POSH-associated diseases such as viral disorders, cancer, and neurological disorders.

Figure 1: Human POSH Coding Sequence (SEQ ID NO:1) (part 1)

Figure 2: Human POSH Amino Acid Sequence (SEQ ID NO:2) (part 2)

MDESALLDLECPVCLERLDASAKVLPQHTFCKRCLLGIVGSRNELRCPECRTLGVSGVEELPSNILLVRLLDGIKQRPWKPGPGGGSGTNCTNALRSQSSTVANCSSKDLQSSQGGQQPRVQSWSPPVRGIPOLPCAKALYNFGKEPGDLKFSKGDIIILRRQVDENWYHGEVNGIHGFFPTNFVQITKPLPQPPPQCKALYDFEVKDKEADKDCLPFAKKDVLTVIRRVDENWAEGMLADKIGIFPISYVEFNSAAKQLIEWDKPPVPGVDAGECSAAAQSSTAPKHSDTKKNTKKRHSFTSLTMANKSSQASQNRHSMEISPPVLISSSNPTAAARISELSGLSCSAPSQVHISTTGLIVTPPPSPVTTGPSFTFPSDVPYQAALGTLNPPLPPPLLAATVLASTPPGATAA AAAAGMGPMPMAGSTDQIAHLRPQTRPSVYVAIYPYTPRKEDELELRKGEMFLVFERCQDGWFKGTSMHTSKIGVFPGNYVAPVTRAVTNASQAKVPMSTAGQTSRGVTMVSPTAGGPAQKLQGNGVAGSPSVVPAAVV SAAHIQTSPQAKVLLHMTGQMTVNQARNAVRTVAAHNQERPTAAVTPIQVQNAAGLSPASVGLSHHSLASPQAPALMPGSATHAAISIRASAPLACAAAAPLTSPSITSASLEAEPSGRIVTVLPGLPTSPDSASSACGNSSATKPDKDSKKEKKGLLKLLSGASTKRKPRVSPPASPTLEVELGSAELPLQGAVGPELPPGGGHGRA GSCPVVDGDPVTTAVAGAALAQDAFHRKASSLDSAVPIAPPQRQACSSLGPVLNESRPVVCERHRVVSY PPQSEAELELKEDIVFVHKKREDGWFKGTLQRNGKTGLFFGSFVENI

Figure 3: Human POSH cDNA Sequence (SEQ ID NO:3)

CTGAGAGACACTGGAGCGGGCAGCGGGTGGGCCATCTGCATCAGCCGCCAGCCCTGGGGGC  
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CTTGTGGATCTTCTGGAGTGTCCGGTGTCTAGAGCGCCTTGATGCTCTGCCAAGGTCTGCCCTGC  
CAGCACTACGTTTCCAAGCGATGTTCTGGGGATCGTAGGTTCTCGAAATGAACCTCAGATGTCGGTCAAGACTTCTGGATGG  
GCAGGACTCTTGTGGCTCGGGTGTGAGGAGCTCCAGTAACATCTGCTGGTCAAGACTTCTGGATGG  
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GAAAATTGGTACCATGGGAAGTCATGGAACTTGTGAGGTTTACCATGGCTTTTCCCCACCAACTTGTGAGGTTT  
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-to be continued

Figure 3: Human POSH cDNA Sequence (SEQ ID NO:3)

CTGACCAAGGTCTTCAGTGCACTCGCTCCCTCTGGCTAAGGCATGCATTAGCCACTACACAAGTCA  
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CTGTGACTGTGGAGCTGGAAAGGCTTGGTGGGAGTGAATTGCCCACACCTTACAATTGTGGCAGGATC  
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TGGTTTTTGCAAGACAGTAGAGGGAGATTGTAAACAAGGGCTTGTACACAGTGAATATGGTAATGATAA  
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TGATGTTCAAACCTTGT

Figure 4: 5' cDNA fragment of human POSH (public gi:10432611; SEQ ID NO:4)

ctgagagacactgcgagcggcgagcgcggtggggccgcatctgcacatcagccgcgcagccgcgtgcggggc  
cgcgaacaagaggaggagccgaggcgcgagagaaagtctgaaatggatgttacatgagtcattttaag  
gatgcacacaactatgaacatttcgtcaagaaaatggatgttctcgatgtttctcgatgtttctcgatgttgc  
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atcaaacagaggccttggaaacctggcttgcgtggggaaatggatctcgatgttctcgatgtttctcgatgttgc  
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gaaggaaaagagcctggagacctaattcagcaaaaggcagatcatatgttgcgaagacaagtggatg  
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cagcagctgtccactgactcccaacccatcaccaggatgttgcacccatggccggccact  
agtgaccgttctccctggactcccaacatctcctgcacagtgttgcacccatggccggccact  
accaaaccagacaaggatgc

Figure 5: N terminus protein fragment of hPOSH (public gi:10432612; SEQ ID NO:5)

MDESALLDLLECPVCLERLDASAKVLPQCQHTFCRKCLLGIVGSRNELRCPECRTLVSGSVEELPSNILLVRLLDGIKQRPWKPQPGGGSGTNCTNALRSQSSTVANCSSKDLQSSQGGQQPRVQSWSPPVRGI PQLPCAKALYNYEGKEPGDLKFKSKGDITILRRQVDENWYHGEVNGIHRGFPTNFPVQIIKEPLPQPPPQCKALYDFEVKDKEADKDCLPFAKDDVLTIRRVDENWAEGMLADKIGIFPPISYVEFNSAAKQLIEWDKPPVPGVDAGECSAAAQSQSTAPKHSIDTKKNTKKRHSFTSLTMANKSSQASQNHRHSMIESPPVLISSSNPTAAARISELSCLSCSAPSQVHISTTGLIVTPPPSSPVITGPSFTFPSDVBYQALGTINPPPLPPPPLLAATVLASTPPGATAAAAAAAGMGPMPMAGSTDQIAHLRPQTRPSVYVAIYPYTPRKEDELELRKGEMFLVFERCQDGWPKGTSMHTSKIGVFPGNVYAPVTRAVTNASQAKVPMSTAGQTSGVTMVPSTAGGPAQKLQGNGVAGSPSVVPAAVVSAAHIQTSPQAKVLLHMTGQMTVNQARNAVRTVAAHNQERPTAAVTFILOVONAAGLSPASVGLSHHSLASPQPAPLMPGSATHAAISISRASAPLACAAAAPLTSPTSITSASLEAEPSGRIVTVLPGLPTSPDSASSACGNSSATKPKDKS

Figure 6: 3' mRNA fragment of hPOSH (public gi:7959248; SEQ ID NO:6)

Figure 7: C terminus protein fragment of hPOSH (public gi:7959249; SEQ ID NO:7)

ISYVEFNSAAKQLIEWDKPPVPGVDAGECSSAAAQSSTAPKHSDTKKNTKKRHSFTSLTMANKSSQASQN  
RHSMEISPPVLISSNPTAAARISELGLSCAPSQVHISTTGLIVTPPPSPVTTGPSFTFPSDVYQA  
ALGTLNPLPLPPPPLLAATVLASTPPGATAAAAAGMGRPMAGSTDQIAHLRPQTTRPSVYVAIYPYTPRK  
EDEELRKGEMFLVFERCQDGWFKGTSMHTSKIGVFPGNVAPVTRAVTNASQAKVPMSTAGQTSRGVTM  
VSPSTAGGPAQKLQGNGVAGSPSVVPAAVSAAHIQTSPQAKVLLHMTGQMTVNZQARNAVRTVAHNQER  
PTAAVTPIQVQNAAGLSPASVGLSHHSLASPQAPLMPGSATHAAISISRAASPLACAAAAPLTSPSIT  
SASLEAEPSGRIVTVLPGLPTSPDSASSACGNSSATKPKDKDSKIEKKGLLKLISGASTKRKPRVSPPASP  
TLEVELGSAELPLQGAVGPELPPGGGHGRAGSCPVDGDGPVTTAVAGAALAQDAPHRKASSLDSAVPIAP  
PPRQACSSLGPVLNESRPVVCEHRVVVSYPPQSEAELELKEGDIVFVHKKREDGWFKGTLQRNGKTGLP  
PGSFVENI

PET/US04/06308

Figure 8: Human POSH full mRNA, Annotated Sequence (part 1)

---- - gi|10432611|dbj|AK021429.1|AK021429 Homo sapiens cDNA,  
FLJ11367 fis, clone HEMBA1000303, highly similar to Mus musculus  
Plenty of SH3s (POSH) mRNA

---- - gi|7959248|dbj|AB040927.1|AB040927 Homo sapiens mRNA for KIAA1494 protein, partial cds

 - Both hPOSH and KIAA1495

## - Ring Domain

- SH3 Domian

- start codon and stop codon of predicted ORF

-to be continued

Figure 8: Human POSH full mRNA, Annotated Sequence (part 2)

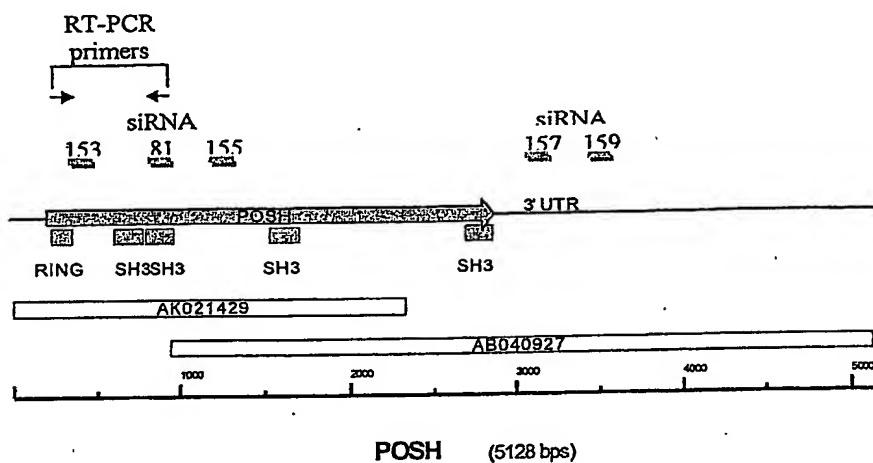
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TGGTTTTGCAAGACAGTAGAGGGAGATTGTGTAACAAGGGCTTGTACACAGTGTATGGTAATGATAA  
AATTGCAATTTCACCTTCTCATGTTAATAATTGAGGACTGGATAAAAGGTTCAAGATTAAATT  
TGATGTTCAAACCTTGT

Figure 9: Domain Analysis of Human POSH

Domain Name	begin	end	E-value
<u>RING</u>	12	52	1.06e-08
<u>SH3</u>	137	192	2.76e-19
<u>SH3</u>	199	258	4.84e-15
<u>low complexity</u>	366	384	-
<u>low complexity</u>	390	434	-
<u>SH3</u>	448	505	2.40e-19
<u>low complexity</u>	547	563	-
<u>low complexity</u>	652	668	-
<u>low complexity</u>	705	729	-
<u>SH3</u>	832	888	1.47e-14

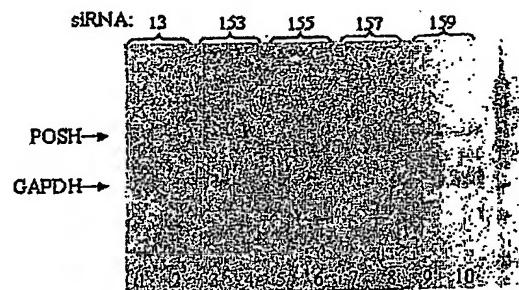
PCT/US04/06308

Figure 10: Diagram of Human POSH Nucleic Acids



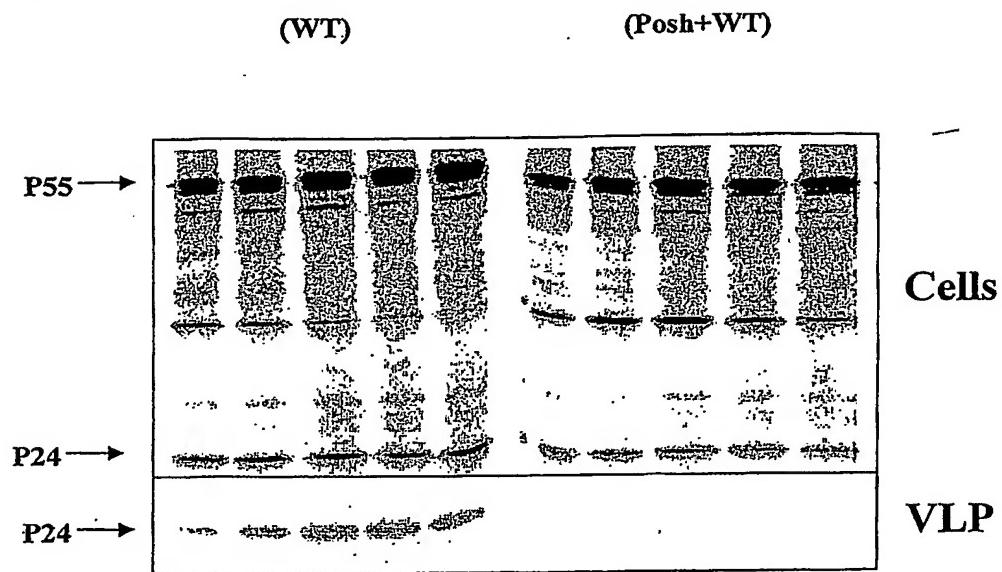
PCT/US04/06308

Figure 11: Reduction in Full Length POSH mRNA by siRNA Duplexes



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Figure 12: POSH Affects Release of VLP from Cells



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Figure 13: Release of VLP from Cells at Steady State

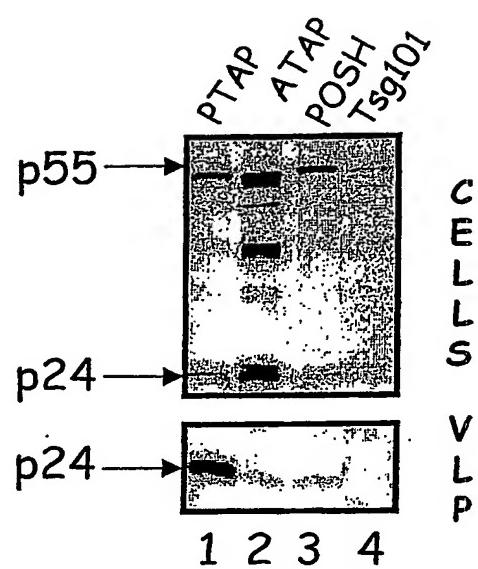


Figure 14: Mouse POSH mRNA sequence (public gi:10946921; SEQ ID NO: 8)

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AAGCCGTTTCTCACTAAAGTCACTCAAGATGGATGAGTCGCTTGTGGACCTCTGGAGTGCCCTGT  
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ACGAGCTCCCCAGTAACATCCTACTGGTCAGACTTCTGGATGGCATCAAGCAGAGGCCCTGGAAACCGG  
CCCTGGTGGGGCGGGACCACCTGCACAAAACACATTAAGGGCCAGGGCAGCACTGTGTTAATTGT  
GGCTGAAAGATCTGCAAGAGCTCCAGTGTGGACAGCAGCCTGGGTGCAAGCCTGGAGCCCCCAGTGA  
GGGGAAATACCTCAGTTACCGCTGCGCAAAGTATTATAACTCAAGGAAAAAGAGCCCCGGAGACCTTAA  
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CGACGACTGACCGTGATCCCGAGAGTGGATGAAAAGTGGCTGAAGGAATGCTGGCAGATAAAATAGGA  
ATATTTCAATTTCATACGTGGAGTTAACTCAGCTGCCAACGCTGATAGAGTGGATAAGCCTCCCG  
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CACCAAGAAGAACCCAGGAAGCGAACACTCCCTCACCTCCCTCACCATGGCCAACAAGTCTTCCCAGGGG  
TCCCAGAACGCCACTCCATGGAGATCAGCCCTCTGTGCTCATCAGTCCAGAACCCACAGCCGAG  
CCCGCATCAGCGAACGTGCTGGGCTCTCTCGCAGCGCCCGTCTCGGTCCATATAAGCACCACTGGGTT  
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ACCCAGGCCGTGATGGGTCTCTGAAACAGATTGCACTTACGGCTCAGACTCGTCCCAGTGTATAT  
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TGTTGAGCGTGTCCAGGACGGCTGGTACAAAGGGACATCGATGACAGGAAAGAGTGGCTTCC  
TGGCAACTATGTGCCCTGGTACAGGCTGCACTGGGCTGCAAGTCCCTCAAGCTAAAGTCTATGTCTACT  
GCGGGTCAGGCAAGTCGGGGGTGACCATGGTCAGCCCTTCACTGCAGGAGGACCTACACAGAACCC  
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AACTCTCAGGCTAAGGTCTGCTGCACATGTCTGGGAGATGACAGTCAATCAGGCCGCAATGCTGTG  
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CCTGCCCTGGTCTGCATCCGGGGCTGCCCATCTCTGGCTCCCAACCTCTGCCCTCCAATGGC  
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GCTTCTCTGGCTCTCCCAAATATGACCGAGTGGCATGTCGACATCGTGGTGGGAAACAGTTCAGCTGG  
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Figure 15: Mouse POSH Protein sequence (Public gi: 10946922; SEQ ID NO: 9)

MDESALLDLLECPVCLERLDASAKVLPQCQHTFCRKCLLGIVGSRNELRCPECRTLGVSGVDELPSNILLVRLLDGIKQRPWKPGGGGGTCTNTLRAQGSTVVNCGSKDLQSSQCGQQPRVQAWSPPVRGIPQLPCAKALNYEGKEPGLKFKSKGDTIILRQRVDENWYHGEVSGVHGFFPTNFVQIIKPLPQPPPQCKALYDFEVKDKEADKDCLPFAKDDVLTVIERRVDENWAEGLADKIGIFPISYVEFNSAAKQLIEWDKPPVPGVDTAECPSATAQSTSASKHPDTKKNTRKRHSPTSLTMANKSSQGSQNRSMEISPPVLISSSNPTAAARISELSGLSCSAPSQVHISTTGLIVTPPPSSPVTTGPAPTFPSDVFYQAALGSMNPPLPPPPLLAATVLAATPSGATAAAVAAAAAAAAGMCPRVMGSEQIAHLRQPTRPSVVAIYPYTPRKEDELELRKGEMFLVFERCQDGWYKGTSMHTSKIGVFPGNVAVPVTAVTNASQAKVSMSTAGQASRGVTMVPSTAGGPTQKPQGNGVAGNPSVVPTAVVSAAHIQTSPQAKVLLHMSGQMTVNQARNAVRTVAAHQSQERPTAAVTPIQVQNAACLGPAVGVLPHHSILASQPLPPMAGPAHGAAVSI SRTNAPMACAAGASLASPNMTSAMLETEPSGRTVTILPGLPTSPE SAASACGNSSAGKPDKDSKKEKKGLLKLLSGASTKRKPRVSPPASPTLDVELGAGEAPLOGAVGPTELPLG GSHGRVGSCPTDGDGPVAAGTAALAQDAFHRKTSSLDAVPIAPP PROACSSLGPVMNEARPVVCERHRVVVSYPPQSEAELELKEGDIVFVHKKREDGWFKGTLQRNGKTGLFPGSFVENI

Figure 16: Drosophila melanogaster POSH mRNA sequence (public gi:17737480; SEQ ID NO:10)

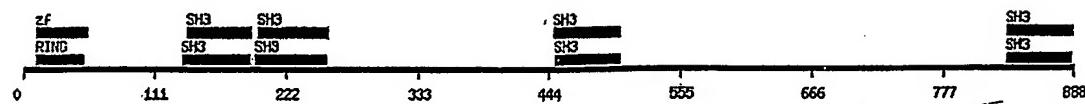
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Figure 17: Drosophila melanogaster POSH protein sequence (public gi:17737481; SEQ ID NO:11)

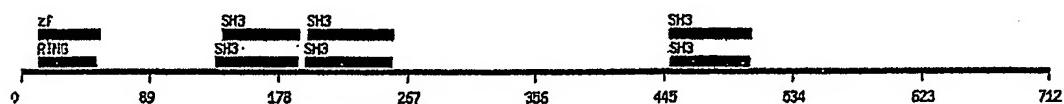
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RILEGMKQNAAGKGEEKGEETETQPERAKPQPPAESVAPPDNQLLQLQSHQQSHQPARHKQRRFLLPHAYALFDASGEATDLFKKKGDLILLIKHRIDNNWFVGQANGQEGTFPINYVKVSVPLPMPQCIAAMYDFKMGPNDEEGCLEFKKSTVIQVMRRVDHNWAEGRIGQTIGIFPIAFVELNAAAKLLDSGLHHTHPFCCHPPKQQGQRALPPVPVIDPTVVTESSSGSSNSTPGSSNSSTSSNNCSPNHQISLPNTPQHVVASGSASVRFRDKGAKEKRHSLNALLGGGAPLSLLQTNRHSAEILSLPHELSRLEVSSSTALKPTSAPQTSRVLKTTVQQQMQPMLPWGYLALFPYKPRQTDELELKKGCYIVTERCVDGFKGKNWLDITGVFPGNYLTPLRARDQQQLMHOWKYVPQNADAQMAQVQQHPVAPDVRLLNMLSQPPDLPPrQQQATATTSCSVWSKPVEALFSRKSEPKPETATASITSSSSGAVGLMRRLTHMKTRSKSPGASLQQVPKEAISTNVEFTTNPSAKLHPVHVRSGSCPSQLQHSQPLNETPAAKTAAQQQFLPKQLPSASTNSVSYGSQRVKGSKERPHLICARQSLDAATFRSMYNNAASPPPPTSVAPAVYAGGQQQVIPGGGAQSQLHANMIAPSHRKSHSLDASHVLSPSSNMITEAAIKASA  
TTKSPYCTRESRFRCIVPYPPNSDIELELHLDIIVYQRKQKNGWYKGTHARTHKTGLFPASFEPDC

Figure 18: POSH Domain Analysis

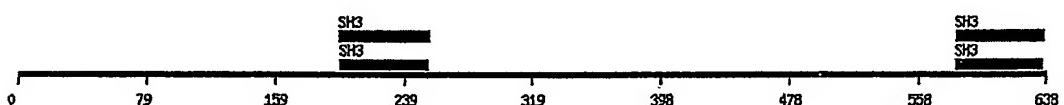
hPOSH protein sequence :



N terminus protein fragment of hPOSH (public gi:10432612):



C terminus protein fragment of hPOSH (public gi:7959249):



Mouse POSH Protein sequence (Public gi: 10946922):



Drosophila melanogaster POSH protein sequence (public gi:17737481)

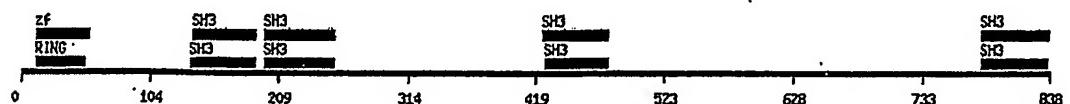


Figure 19: Human POSH has ubiquitin ligase activity

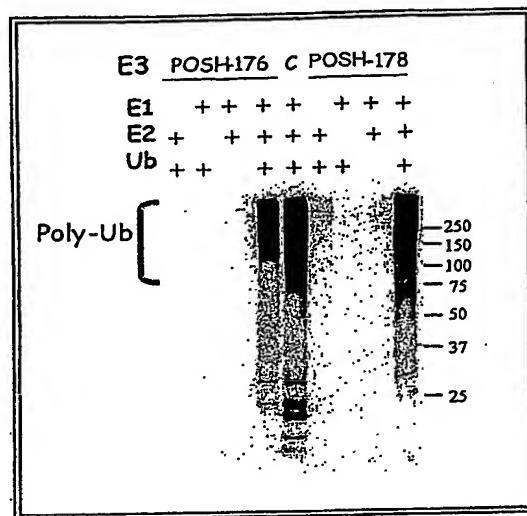
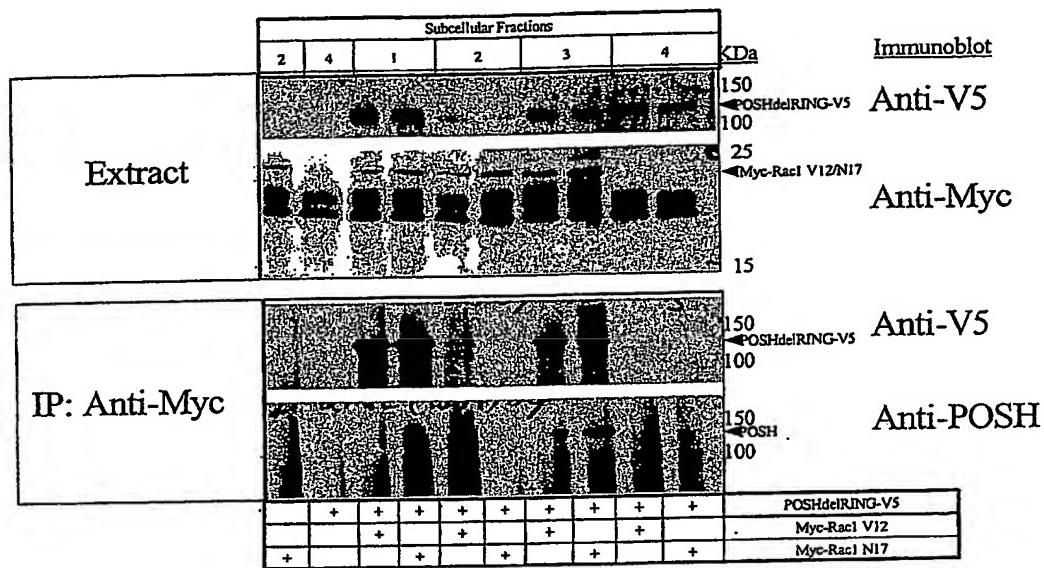


Figure 20



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Figure 21. PLD activity in medium of transfected cells

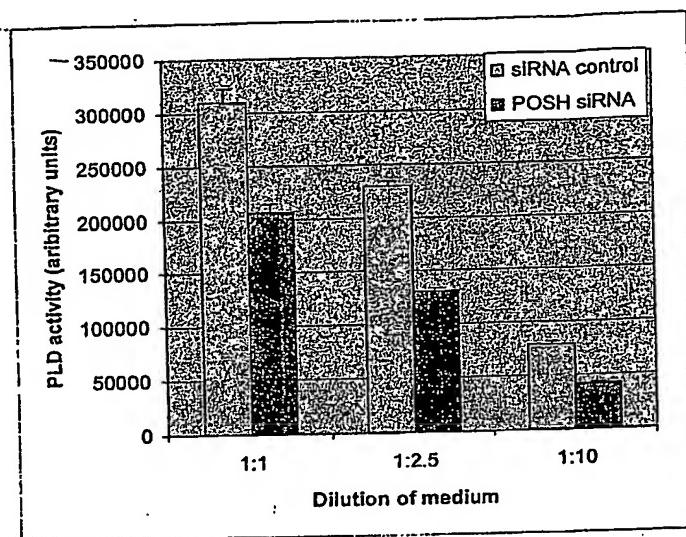


Figure 22.

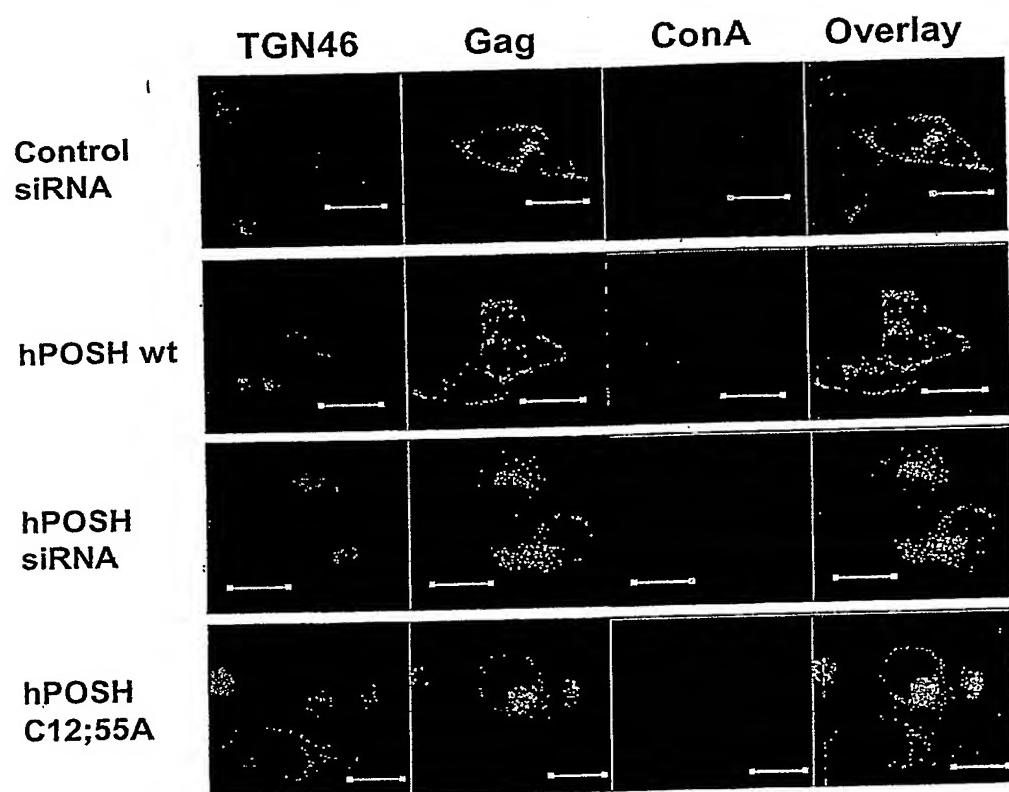
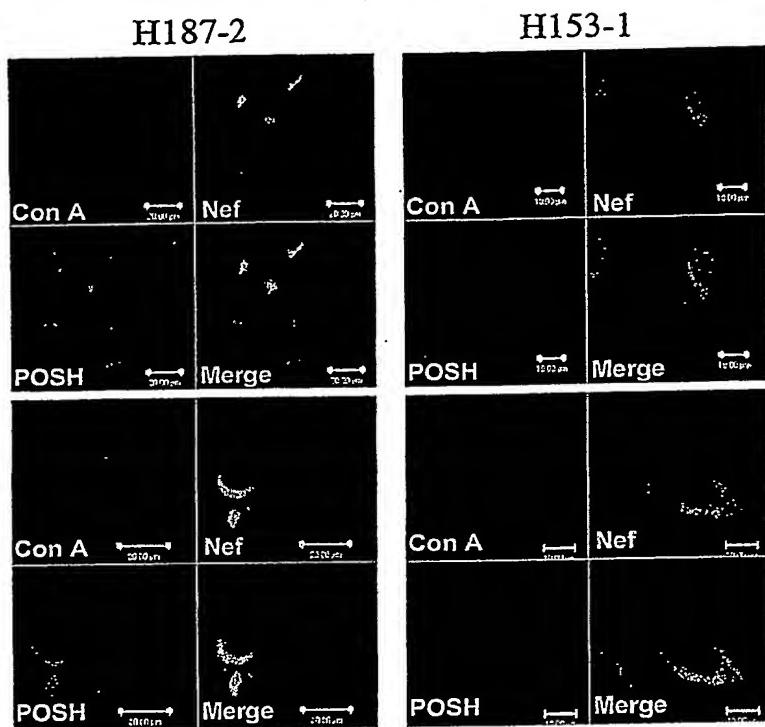
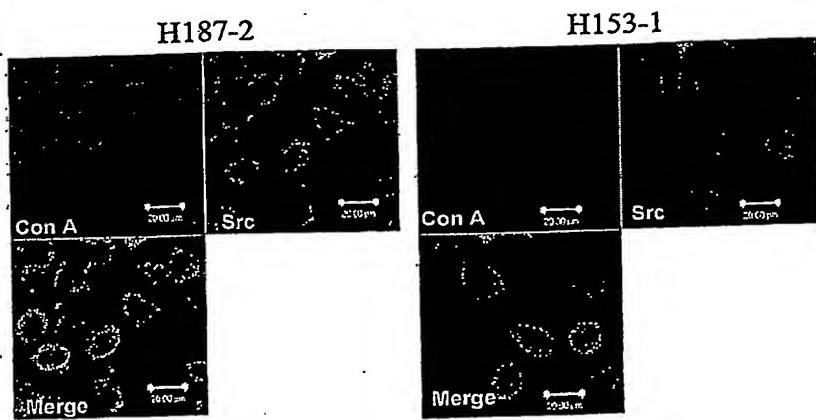


Figure 23.



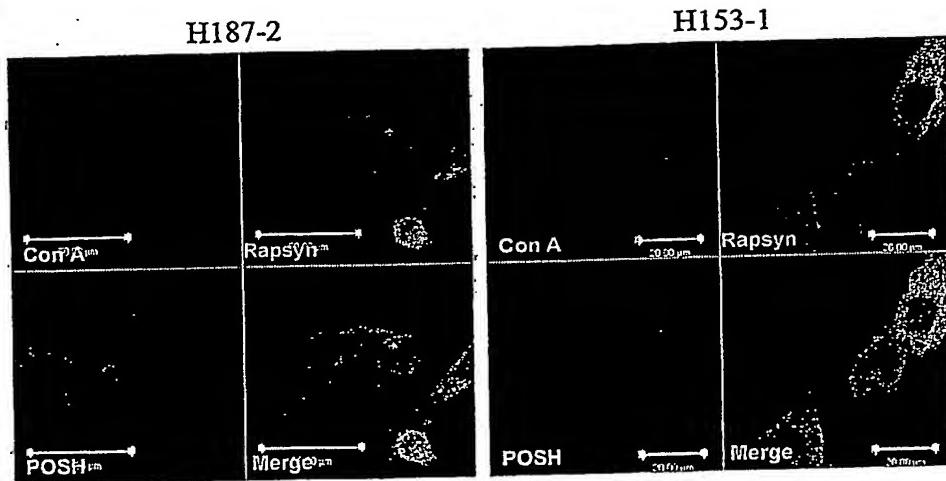
PCT/US04/06308

Figure 24.



PCT/U504/06308

Figure 25.



PCT/US04/06308

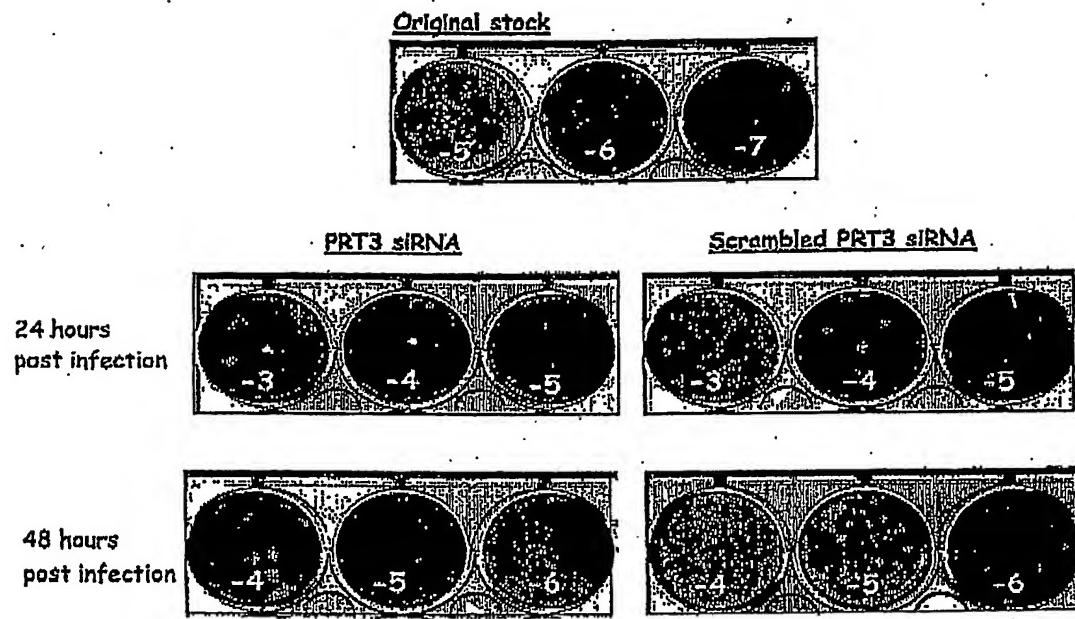


FIGURE 26

PCT/US04/06308

Figure 27.

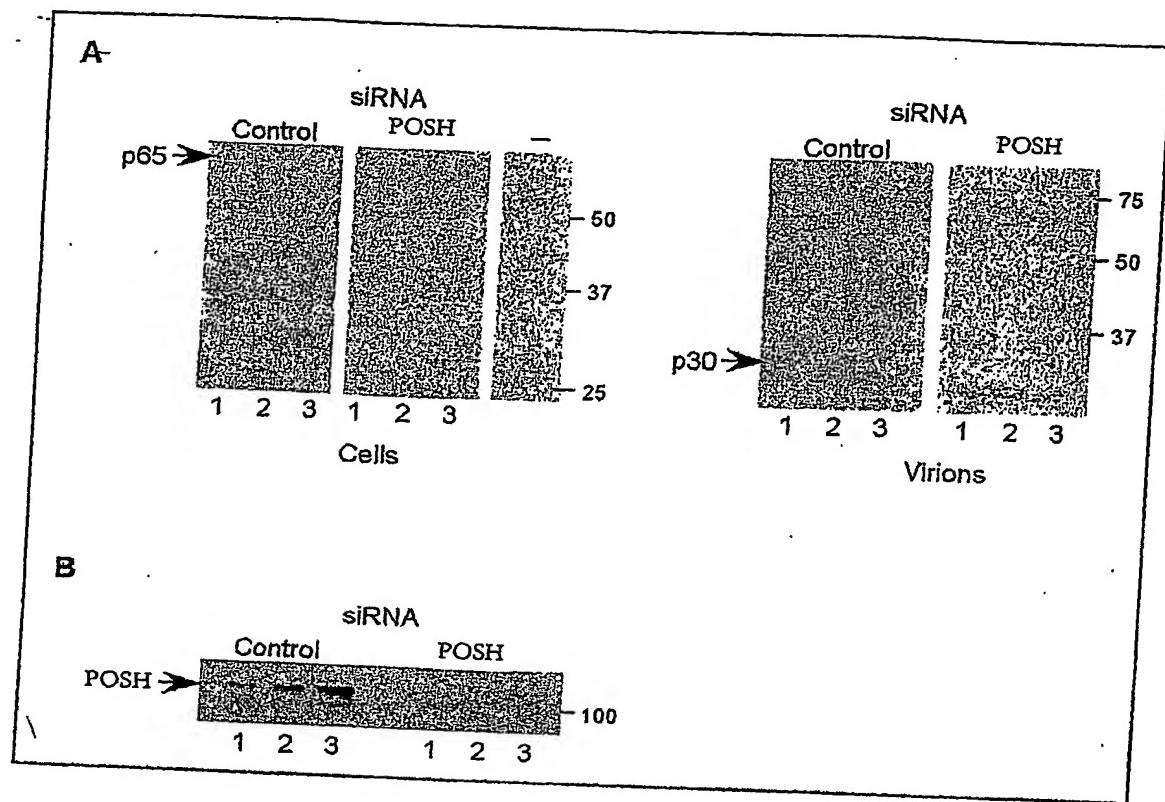
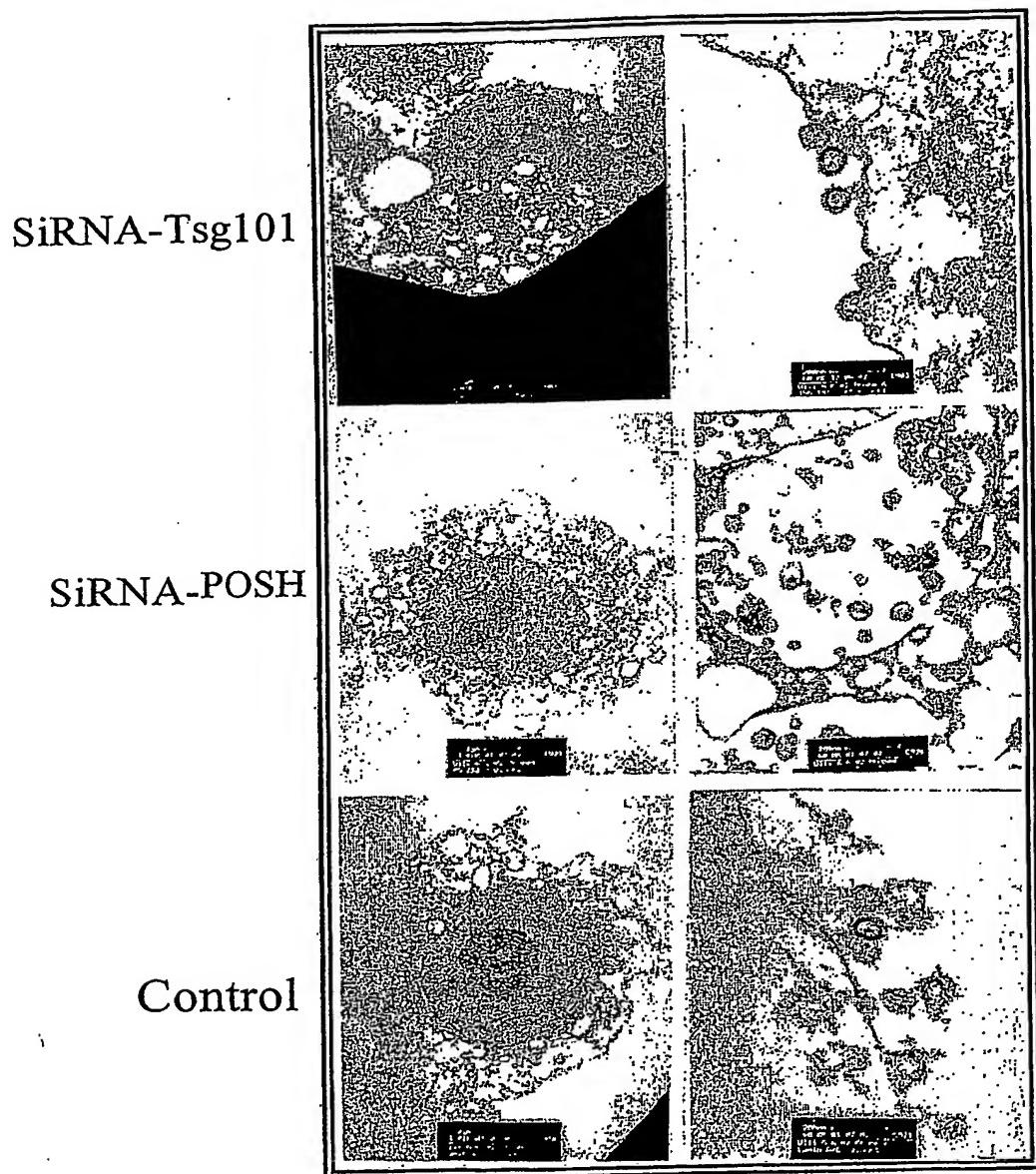
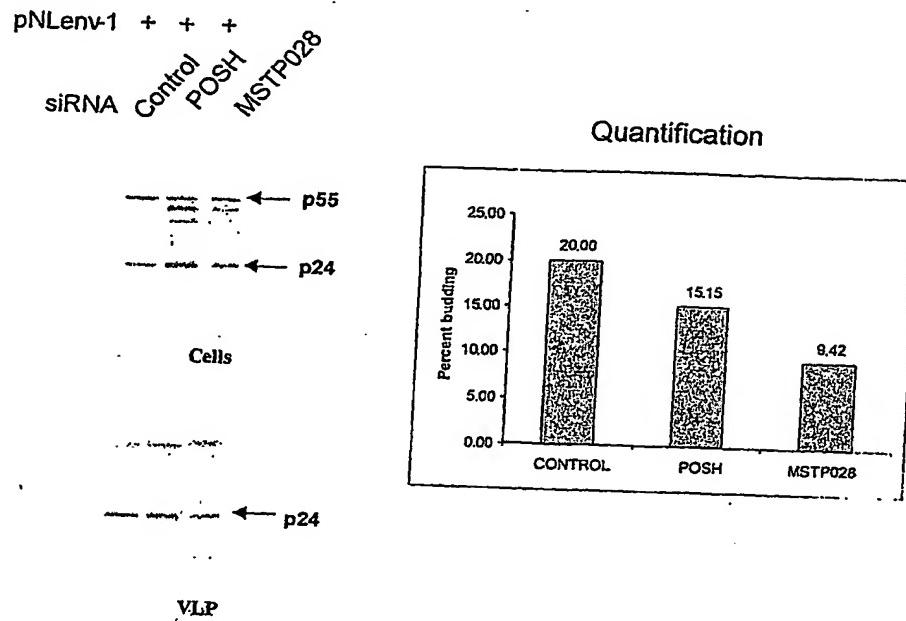


Figure 28.



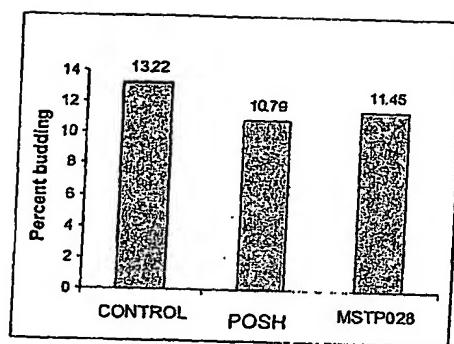
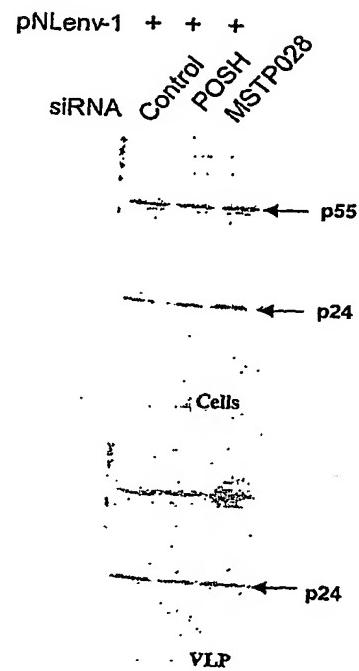
PCT/US04/06308

Figure 29A.



PCT/US204/06308

Figure 29B.



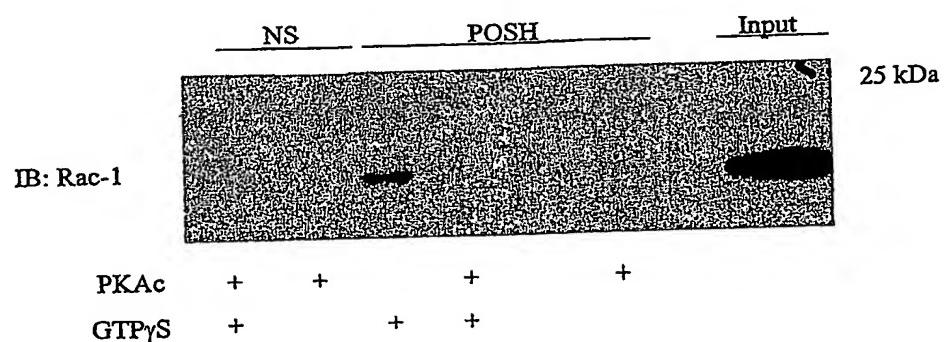
PCT/US04/06308

Figure 30. Putative PKA phosphorylation sites in hPOSH.

MDESALLLLECPVCLERLDASAKVLP[CQHTFCKRCLLGIVGSRNELRCPECRTLVGSGVEELPSNILLVRLLDGIKQRPWKEPGPGGGSGTNCTNALRSQ[STVANCSSKDLQSSQGGQQPRVQ[SWSPPVRGI[POLPCAKALYNYEKEPGDLKFSKGDIIILRRQVDENWYHGEVNGI[HGFFPTNFVQI[KLPLQPPPQCKALYDFEVKDKEADKDCLPFAKDDVLTIVIRRVDENWAEGMLADKIGIFPISYVEFNSAAKQLIEWDKPPVPGDAGECSAAAQSSTAPKHSDT[KKN[KKRHSFTSLTMANKSSQASQNRHSMEISPPVLISSSNPTAAARISELSGLS  
CSAPSQVHISTTGLIVTPPPSSPVTTGPSFTFPSDVYQAALGTLNPPLPPPLLAATVLASTPPGATAAAAGMGRPMAGSTDQIAHLRPQTRPSVYVAIYPYTPRKED[ELELRKGEMFLVFERCQDGWFKGTSMHTSKIGVFPGNVAVPVT[RATVNASQAKVPMSTAGQT[RGVTMVSPTAGGPAQKLQGNGVAGSPSVPAAVVSAAHIQTSPQAKVLLHMTGQMTVNQARNAVRTVAAHNOERPTAAVTP[QVQNAAGLSPASVGLSHSLASPQPA[MPGSATHAAISISRASAPLACAAAAPLTSITSASLEAEPSGRIVTVLPGLPTSPDSASSACGNSSATKPKDKDSKKEKKGLLKLLSGASTKRKPRVSP[PSPTLÉVELGSAELPLQGAVGP[ELPPGGGHGRA[GCPVDGDGPVTTAVAGAALAQDAFH[RKA[SLDSAVPIAPP[QACSSLGPVLNESRPVVCERHRVVVSYPPQSEAELELKEGDIVFVHKKREDGWFKGTLQRNGKTGLFPGSFVENI

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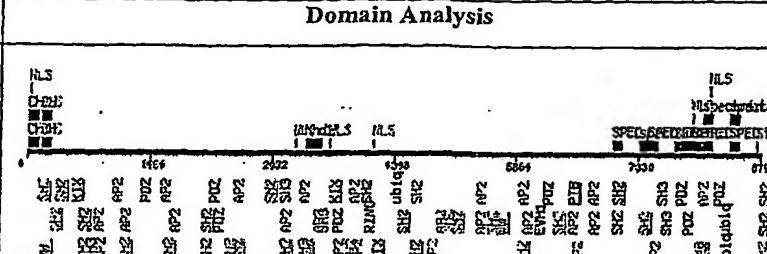
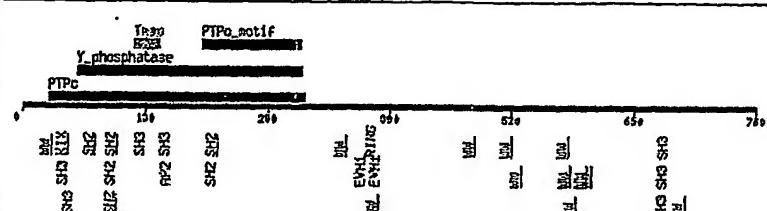
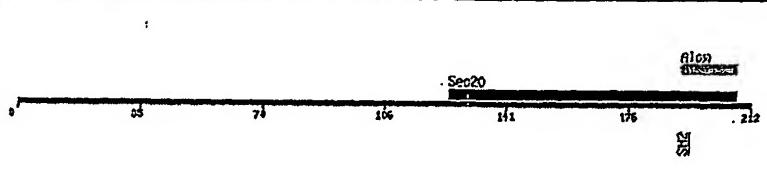
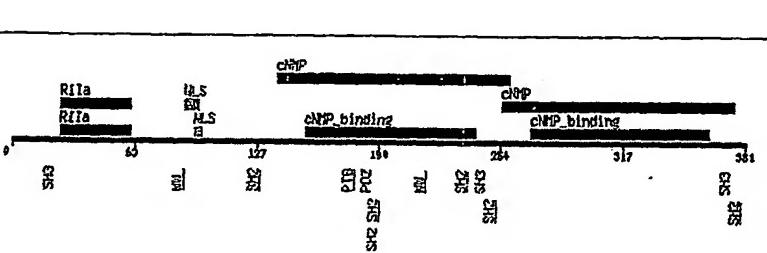
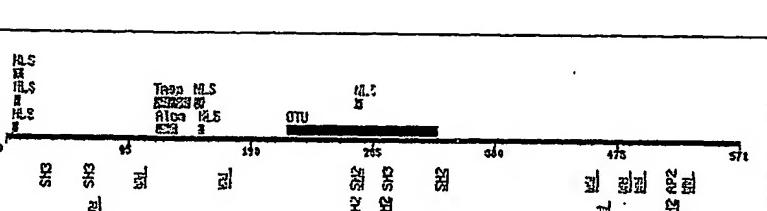
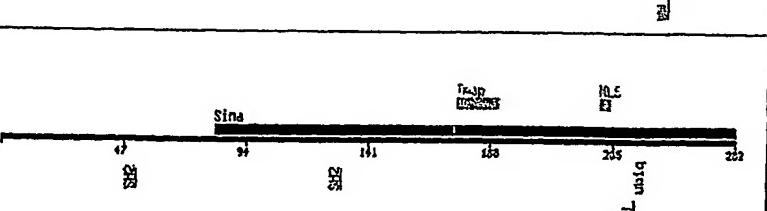
Figure 31. Phosphorylation of hPOSH regulates binding of GTP-loaded Rac-1.



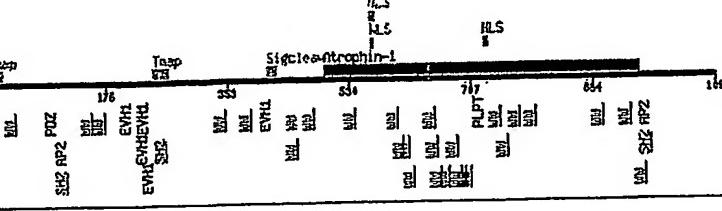
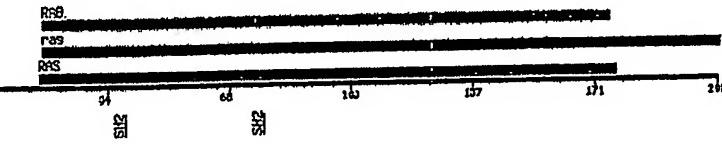
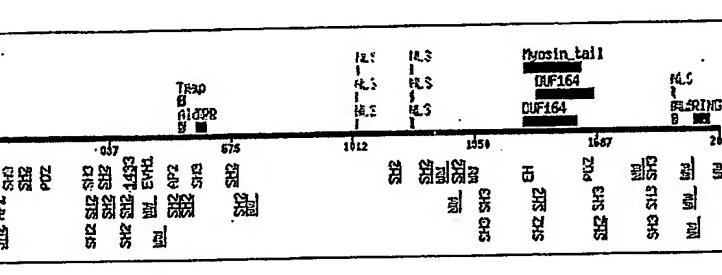
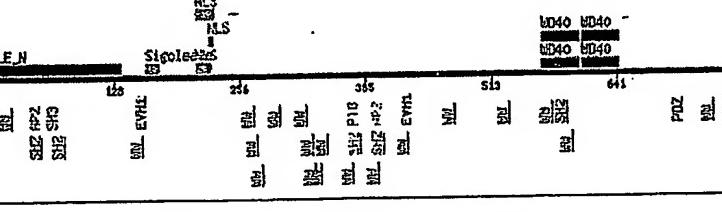
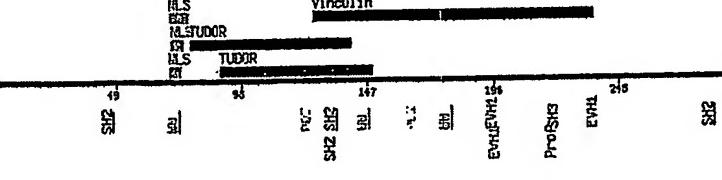
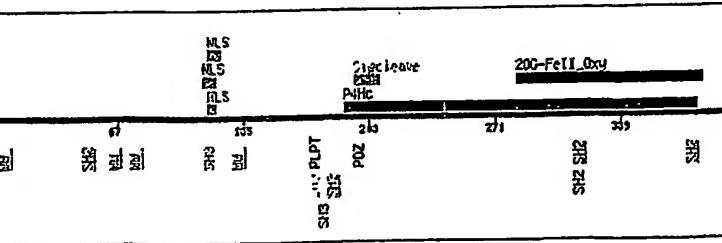
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Figure 32.

BLAST hit	UniGene	Name	Longest Protein	Domain Analysis
AK092170	Hs.302 746	MSTP028		
AB011155. 1	Hs.170 290	DLG5 discs, large (Drosophila) homolog 5	NP_0047 38 aa887	
XM_20894 4.1	None		XP_2089 44.1	
AB046818	Hs.237 40	KIAA1598 KIAA1598 protein	1004727 1 aa146	
BC018733. 1	Hs.208 14	CGI-27 C21orf19-like protein	4680693	
AL080170. 1	Hs.516 92	BIA2 BIA2	5262640	
BC036531 .1	Hs.17 2928	COL1A1 collagen, type I, alpha 1		
J03930.1		Human intestinal alkaline phosphat		

BLAST hit	UniGene	Name	Longest Protein	Domain Analysis
AP535142	Hs.416 719	SYNE1 spectrin repeat containing, nuclear envelope 1	AAN6044; <u>2.1</u> 8797 aa	
M93425	Hs.62	PTPN12 protein tyrosine phosphatase, non-receptor type 12	<u>292409</u> aa504>	
BC009710	Hs.100 651	GOSR2 golgi SNAP receptor complex member 2	<u>1690552</u> <u>2</u> <u>1690552</u> <u>0</u>	
M18468 M18468 BC036285 M18468	Hs.183 037	PRKAR1A protein kinase, cAMP-dependent, regulatory, type I, alpha (tissue specific extinguisher 1)		
AL137509 in 3'UTR?	Hs.184 029	DKFZp761A 052 hypothetical protein	<u>AAH099</u> <u>17</u>	
BC013082 U76247	Hs.295 923	SIAH1 seven in absentia homolog 1 (Drosophila)	AAC5190 7	
BC032851	Hs.314 4	CBLB Cas-Br-M (murine) ecotropic		

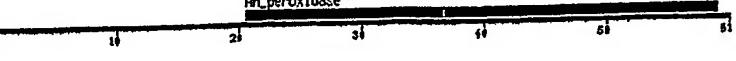
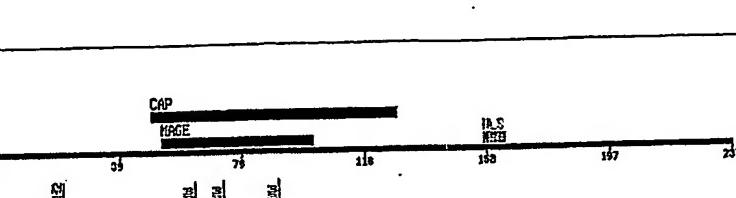
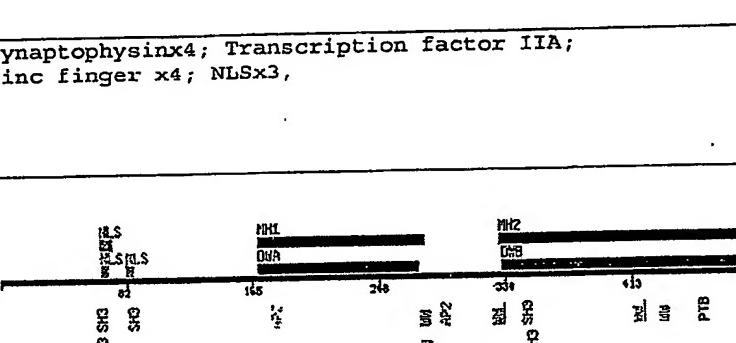
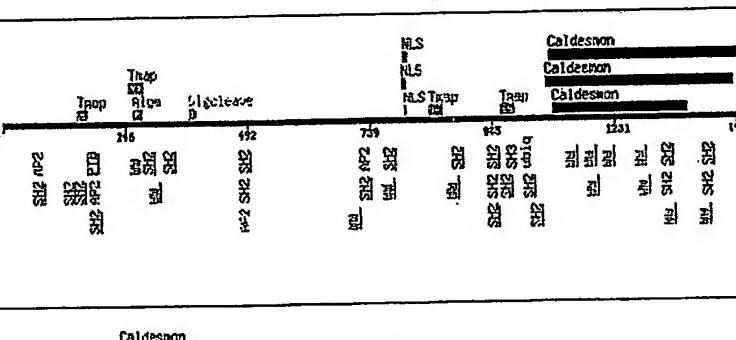
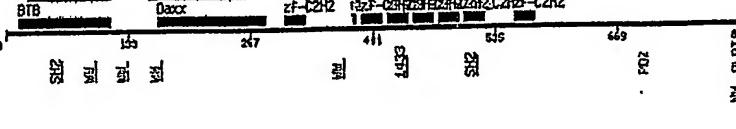
PCT/US04/06308

BLAST hit	UniGene	Name	Longest Protein	Domain Analysis	
		retroviral transforming sequence b			
BC006358 -bp 2026 bp 1561 bp1564 bp1562 bp1561 bp1564	Hs.660 48	VCY2IP1 VCY2 interacting protein 1	21739763		
BC039858	Hs.690 6	RALA v-ral simian leukemia viral oncogene homolog A (ras related)	24980847 aa1>		
D83077	Hs.118 174	TTC3 tetratricopeptide repeat domain 3	1304132 aa1027 aa1040		
M99435	Hs.289 35	TLE1 transducin-like enhancer of split 1 (E(sp1) homolog, Drosophila)	307510		
U18423	Hs.288 986	SMN1 survival of motor neuron 1, telomeric	624186		
BC00172 3, AJ31054 4	Hs.324 277	EGLN2 egl nine homolog 2 (C. elegans)	14547148		
BC000386	Hs.581 89	EIF3S3 eukaryotic translation			



BLAST hit	UniGene	Name	Longest Protein	Domain Analysis	
AL1374 93	Hs.359 45	DKFZp434B 1231 hypothetical protein DKFZp434B1 231	6808117	<p>Detailed description: This diagram shows a protein sequence from position 0 to 358. It features two Ig domains (IG) at positions 159-175 and 265-281. A Sieclease domain is located between positions 64 and 122. The sequence is flanked by SH2 and SH3 domains.</p>	
L06425	Hs.181 244	HLA-A	575249	<p>Detailed description: This diagram shows a protein sequence from position 0 to 365. It includes an Ig domain (IG) at 245-261, another Ig domain (IG) at 281-297, a Transmembrane domain (TM) at 341-357, and an HNC_I domain at 199-215.</p>	
BC008345	Hs.301 512	NUMA1 nuclear mitotic apparatus protein 1	14249928 963aa  35119 2115aa	<p>Detailed description: This diagram shows a protein sequence from position 0 to 2115. It contains four Mucoin_tail domains (Mucoin_tail) at 252-278, 321-347, 481-507, and 631-657. A Cellulose binding domain (Cellulose_b) is located at 1762-1885.</p>	
AF077202 AF077202	Hs.397 853	HSPC016 hypothetical protein HSPC016	1265453 7 64aa	<p>Detailed description: This diagram shows a protein sequence from position 0 to 64. It features a single MLS domain (MLS) at 10-21.</p>	
BC000449	Hs.183 704	UBC			
D26121	Hs.169 303	ZFM1 protein alternatively spliced product domain A, B and G		<p>Detailed description: This diagram shows a protein sequence from position 0 to 66. It contains three MLS domains (MLS) at 14-25, 26-37, and 48-59.</p>	
AF077952	Hs.105 779	PIASy protein inhibitor of activated STAT protein PIASy	3643111	<p>Detailed description: This diagram shows a protein sequence from position 0 to 51. It includes a SAP domain (SAP) at 63-70, a zfp-IIIz domain (zfp-IIIz) at 235-246, and a Daxx domain (Daxx) at 425-451.</p>	

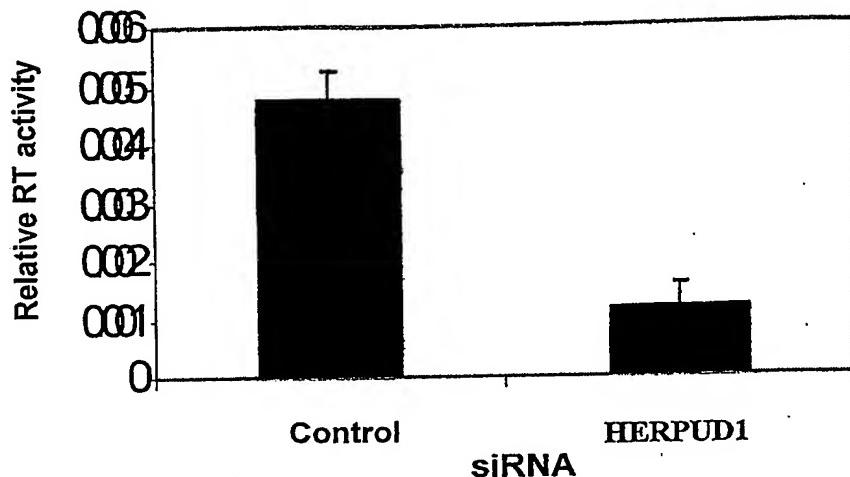
PCT/US04/06308

BLAST hit	UniGene	Name	Longest Protein	Domain Analysis	
BC007034	Hs.118 786	MT2A metallothionein 2A	1393785 7		
AF293026	Hs.325 87	SRA1 steroid receptor RNA activator 1	9930614		
X66899	Hs.129 953	EWSR1 Ewing sarcoma breakpoint region 1			Synaptophysin x4; Transcription factor IIA; zinc finger x4; NLSx3,
AF035528	Hs.153 863	MADH6 MAD, mothers against decapentaplegic homolog 6 (Drosophila)	2736316		
AF441770	Hs.164 11	THOC2 THO complex 2	AAM2843 6		
Y09723	Hs.335 32	ZNF151 zinc finger protein 151 (pHZ-67)	2230871		

BLAST hit	UniGe ne.	Name	Longest Protein	Domain Analysis
BC0127 26	Hs.693 31	DDX31 DEAD/H (Asp-Glu-Ala- Asp/His) box polypeptide 31	<u>7505907</u>	<p>Diagram illustrating domain organization for DDX31. The protein length is 7505907. Domains include:</p> <ul style="list-style-type: none"> <li>SH3_Rings3: Positions 1-114</li> <li>Ocludin: Positions 115-125</li> <li>DEAD: Positions 126-145</li> <li>DEAD: Positions 146-155</li> <li>Tsp_Significance_C: Positions 156-167</li> <li>SH2_SSP: Positions 168-175</li> <li>SH2_SSP: Positions 176-183</li> <li>NLS: Positions 184-191</li> <li>NLS: Positions 192-199</li> <li>NLS: Positions 200-207</li> <li>NLS: Positions 208-215</li> <li>NLS: Positions 216-223</li> <li>NLS: Positions 224-231</li> <li>NLS: Positions 232-239</li> <li>NLS: Positions 240-247</li> <li>NLS: Positions 248-255</li> <li>NLS: Positions 256-263</li> <li>NLS: Positions 264-271</li> <li>NLS: Positions 272-279</li> <li>NLS: Positions 280-287</li> <li>NLS: Positions 288-295</li> <li>NLS: Positions 296-303</li> <li>NLS: Positions 304-311</li> <li>NLS: Positions 312-319</li> <li>NLS: Positions 320-327</li> <li>NLS: Positions 328-335</li> <li>NLS: Positions 336-343</li> <li>NLS: Positions 344-351</li> <li>NLS: Positions 352-359</li> <li>NLS: Positions 360-367</li> <li>NLS: Positions 368-375</li> <li>NLS: Positions 376-383</li> <li>NLS: Positions 384-391</li> <li>NLS: Positions 392-399</li> <li>NLS: Positions 400-407</li> <li>NLS: Positions 408-415</li> <li>NLS: Positions 416-423</li> <li>NLS: Positions 424-431</li> <li>NLS: Positions 432-439</li> <li>NLS: Positions 440-447</li> <li>NLS: Positions 448-455</li> <li>NLS: Positions 456-463</li> <li>NLS: Positions 464-471</li> <li>NLS: Positions 472-479</li> <li>NLS: Positions 480-487</li> <li>NLS: Positions 488-495</li> <li>NLS: Positions 496-503</li> <li>NLS: Positions 504-511</li> <li>NLS: Positions 512-519</li> <li>NLS: Positions 520-527</li> <li>NLS: Positions 528-535</li> <li>NLS: Positions 536-543</li> <li>NLS: Positions 544-551</li> <li>NLS: Positions 552-559</li> <li>NLS: Positions 560-567</li> <li>NLS: Positions 568-575</li> <li>NLS: Positions 576-583</li> <li>NLS: Positions 584-591</li> <li>NLS: Positions 592-599</li> <li>NLS: Positions 600-607</li> <li>NLS: Positions 608-615</li> <li>NLS: Positions 616-623</li> <li>NLS: Positions 624-631</li> <li>NLS: Positions 632-639</li> <li>NLS: Positions 640-647</li> <li>NLS: Positions 648-655</li> <li>NLS: Positions 656-663</li> <li>NLS: Positions 664-671</li> <li>NLS: Positions 672-679</li> <li>NLS: Positions 680-687</li> <li>NLS: Positions 688-695</li> <li>NLS: Positions 696-703</li> <li>NLS: Positions 704-711</li> <li>NLS: Positions 712-719</li> <li>NLS: Positions 720-727</li> <li>NLS: Positions 728-735</li> <li>NLS: Positions 736-743</li> <li>NLS: Positions 744-751</li> <li>NLS: Positions 752-759</li> <li>NLS: Positions 760-767</li> <li>NLS: Positions 768-775</li> <li>NLS: Positions 776-783</li> <li>NLS: Positions 784-791</li> <li>NLS: Positions 792-799</li> <li>NLS: Positions 800-807</li> <li>NLS: Positions 808-815</li> <li>NLS: Positions 816-823</li> <li>NLS: Positions 824-831</li> <li>NLS: Positions 832-839</li> <li>NLS: Positions 840-847</li> <li>NLS: Positions 848-855</li> <li>NLS: Positions 856-863</li> <li>NLS: Positions 864-871</li> <li>NLS: Positions 872-879</li> <li>NLS: Positions 880-887</li> <li>NLS: Positions 888-895</li> <li>NLS: Positions 896-903</li> <li>NLS: Positions 904-911</li> <li>NLS: Positions 912-919</li> <li>NLS: Positions 920-927</li> <li>NLS: Positions 928-935</li> <li>NLS: Positions 936-943</li> <li>NLS: Positions 944-951</li> <li>NLS: Positions 952-959</li> <li>NLS: Positions 960-967</li> <li>NLS: Positions 968-975</li> <li>NLS: Positions 976-983</li> <li>NLS: Positions 984-991</li> <li>NLS: Positions 992-999</li> <li>NLS: Positions 1000-1007</li> </ul>
NM_032958	Hs.375 562	POL R2J2 DNA directed RNA polymerase II polypeptide J- related gene		
AF068235. 1	Hs.433 759	BANF1 barrier to autointegration factor 1	<u>3002951</u>	<p>Diagram illustrating domain organization for BANF1. The protein length is 3002951. Domains include:</p> <ul style="list-style-type: none"> <li>BRF: Positions 1-23</li> <li>BRF: Positions 24-46</li> <li>BRF: Positions 47-69</li> <li>BRF: Positions 70-92</li> <li>BRF: Positions 93-115</li> <li>BRF: Positions 116-138</li> </ul>
BC014967. 1	Hs.563 7	CBX4 chromobox homolog 4	<u>4502603</u> aa319	<p>Diagram illustrating domain organization for CBX4. The protein length is 4502603. Domains include:</p> <ul style="list-style-type: none"> <li>CHROMO: Positions 1-35</li> <li>CHROMO: Positions 36-58</li> <li>CHROMO: Positions 59-81</li> <li>CHROMO: Positions 82-104</li> <li>CHROMO: Positions 105-127</li> <li>CHROMO: Positions 128-150</li> <li>CHROMO: Positions 151-173</li> <li>CHROMO: Positions 174-196</li> <li>CHROMO: Positions 197-219</li> <li>CHROMO: Positions 220-242</li> <li>CHROMO: Positions 243-265</li> <li>CHROMO: Positions 266-288</li> <li>CHROMO: Positions 289-311</li> <li>CHROMO: Positions 312-334</li> <li>CHROMO: Positions 335-357</li> <li>CHROMO: Positions 358-380</li> <li>CHROMO: Positions 381-403</li> <li>CHROMO: Positions 404-426</li> <li>CHROMO: Positions 427-449</li> <li>CHROMO: Positions 450-472</li> <li>CHROMO: Positions 473-495</li> <li>CHROMO: Positions 496-518</li> <li>CHROMO: Positions 519-541</li> <li>CHROMO: Positions 542-564</li> <li>CHROMO: Positions 565-587</li> <li>CHROMO: Positions 588-610</li> <li>CHROMO: Positions 611-633</li> <li>CHROMO: Positions 634-656</li> <li>CHROMO: Positions 657-679</li> <li>CHROMO: Positions 680-697</li> <li>CHROMO: Positions 698-715</li> <li>CHROMO: Positions 716-733</li> <li>CHROMO: Positions 734-751</li> <li>CHROMO: Positions 752-769</li> <li>CHROMO: Positions 770-787</li> <li>CHROMO: Positions 788-805</li> <li>CHROMO: Positions 806-823</li> <li>CHROMO: Positions 824-841</li> <li>CHROMO: Positions 842-859</li> <li>CHROMO: Positions 860-877</li> <li>CHROMO: Positions 878-895</li> <li>CHROMO: Positions 896-913</li> <li>CHROMO: Positions 914-931</li> <li>CHROMO: Positions 932-949</li> <li>CHROMO: Positions 950-967</li> <li>CHROMO: Positions 968-985</li> <li>CHROMO: Positions 986-993</li> <li>CHROMO: Positions 994-999</li> <li>60s_rRNA_methylase: Positions 1000-1007</li> </ul>

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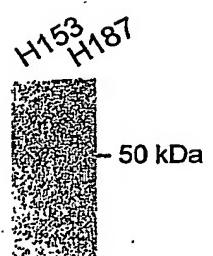
Figure 33.



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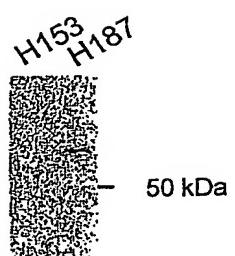
Figure 34A.

A



IB: anti-Herp

B

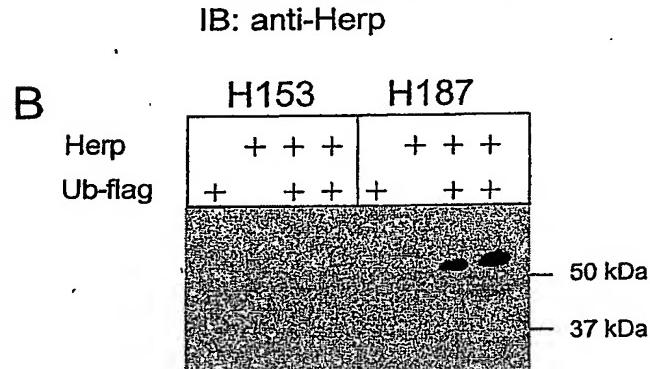
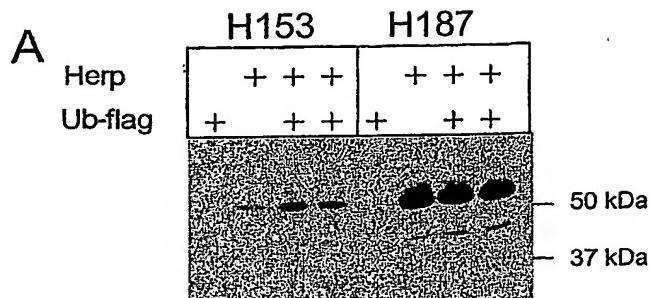


IP: anti-Flag (Ubi)

IB: anti-Herp

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Figure 34B.



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Figure 35.

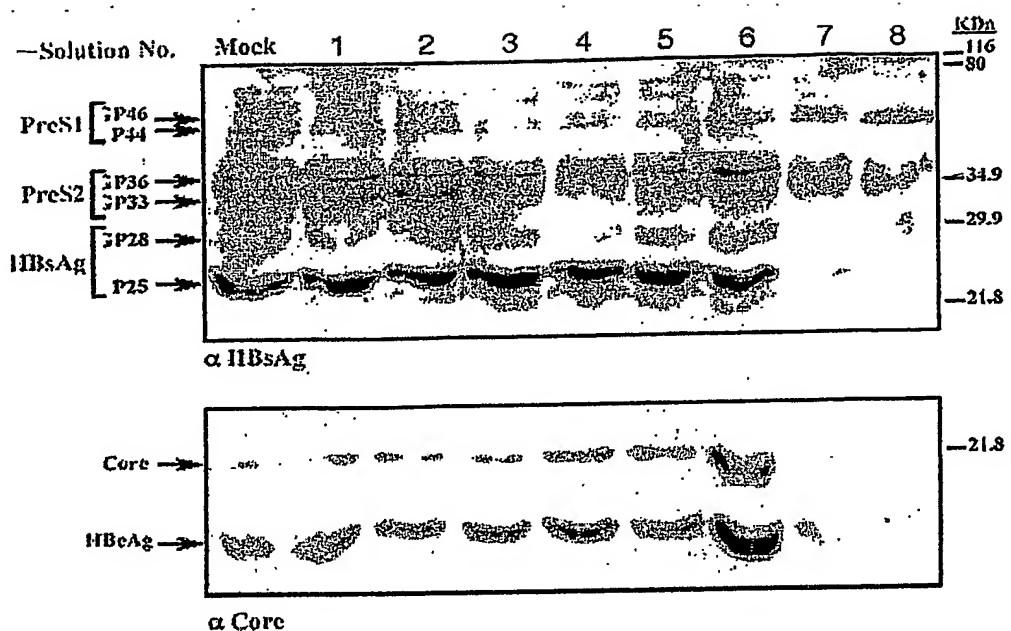


FIGURE 36

Unigene Name: Arf1 Unigene ID: Hs.286221

Human Arf1 mRNA sequence - var1 (public gi: 3360490) (SEQ ID NO: 325)  
GCAAAACCAACGCCCTGGCTGGAGCAGCAGCCCTTGAGGTGCTCCCTGCCAGTGTCTTCACCTGTCCA  
CAAGCATGGGAACATCTCGCAACCTCTTCAAGGGCTTTTGCAAAAAAGAAATGCGCATCCTCAT  
GGTGGGCTGGATGCTGCAGGGAGACCACGATCCTCTACAAGCTTAAGCTGGTGGAGATCGTGGACCACC  
ATTCCCACCATAGGCTTCAACGTGGAAACCGTGGAGTACAAGAACATCAGCTTCACTGTGTGGAGCTGG  
GTGGCCAGGACAAGATCAGGCCACTACTTCCAGAACACACAAGGCCATGATCTTCGTGG  
GGACAGCAATGAGAGAGCGTGTGAAACGAGGCCGTGAGGAGCTCATGAGGATGCTGGCCGAGGACGAG  
CTCCGGGATGCTCTCTGGTGTGCCAACAGCAGGACCTCCAAACGCCATGAAATGCCGCCAGA  
TCACAGAACAGCTGGGCTCACTACTACGCCAACAGGAACCTGGTACATTCAAGGCCACCTGCCACCAG  
CGGCGACGGCTCTATGAAGGACTGGACTGGCTGTCCAATCAGCTGGAAACAGAACGTGAAACCGCACCC  
CCCTCCCTCTCACTCCTTGTGCCCTGTGTTACTCTCATGTGGCAAACGTGGCTGTGGTGTGAGTG  
CCAGAAGCTGCCCTCGTGGTTGGTCAACCGTGTGCATCGCACCGTGTGAAATGTGGCAGACGCCAGCCT  
GGGCCAGGTTTTATTTAATGAAATAGTTTGTGTTCCAATGAGGAGTTCTGGTACTCCTATGCA  
ATATTACTCAGTTTTTATTGAAAAAGAAAATCAACTCACTGTTCAGTGTGAGAGGGATGTAGG  
CCCATGGGACCTGGCTCCAGGAGTCGCTGTGGAGAGGCCACGCCCTGGCTTAGAGCTGT  
GTGAAATCCATTGGTGGTTGGTTTAACCAAACCTCAGTGCATTTTAAATAGTAAAGAATCCA  
AGTCGAGAACACTTGAAACACAGAACAGAGGAGACCCGCCACTAGCATAGATTGCAAGTTACGCCCTGGATGC  
CAGTCGCCAGGCCAGTGTCCCCCTGGGAACATGAGGTGGTGGCGCAGCAGACTGCCATCAATTCT  
GCATGGTCACAGTAGAGATCCCCGCAACTCGCTGTGGTCACTGGCATGTCATGGT  
TGTCCCTGTGCTCCCAGGCTGGGCCAGGCTGGAGGCCACAGGCCACCCACTATGCCGCCAGGCC  
GCCCTACCCACCTTCAGGAGCAGCTATGGGACGAGGCCACATCTGCCCCCTGGTGTGGCAGA  
GTGGGCTCGTCCCACACTCGTGTGCTCAGACACTTGGCAGGATGCTGGGCTCACCAGCA  
GGAGCGCTGCAAGCGGGCAGGGCGTCCACCTAGACCCACAGGCCCTGGGAGCACCCACCTCTGTG  
GTGATGTAGCTTCTCCCTCGCCTGCAAGGGTCCGATTGCCATGAAAAGACAACCTCTACTTT  
TTCTTTGTATTTGATAAAACACTGAAGCTGGAGCTGTTAAATTATCTTGGGAAACCTCAGAAGTGGT  
CTATTGGTGTGCTGGAACCTCTTACTGTTCAATACAGATTAGTAATCAAAAAAAAAAAAA  
AAAAAAA

Human Arf1 mRNA sequence - var2 (public gi: 30583624) (SEQ ID NO: 326)  
ATGGGGAAACATCTCGCAACCTCTCAAGGGCTTTGGCAAAAAGAAATGCGCATCCTCATGGTGG  
GCCGGATGCTGCAGGGAAAGACCACGATCCTCTACAAGCTTAAGCTGGTGGAGATCGTGGACCACCATTC  
CACCATAGGCTTCAACGTGGAAACCGTGGAGTACAAGAACATCAGCTTCACTGTGTGGAGCTGGTGG  
CAGGACAAGATCAGGCCCTGTGGCGCCACTACTTCCAGAACACACAAGGCCCTGATCTTCGTGGTGGACA  
GCAATGACAGAGAGCGTGTGAACGAGGCCGTGAGGAGCTCATGAGGATGCTGGCGAGGAGCTCCG  
GGATGCTGCTCTCTGGTGTGCCAACAGCAGGACCTCCCAACGCCATGAATGCCGCCAGATCACA  
GACAAGCTGGGCTGCACTCACTACGCCAACAGGAACCTGGTACATTCAAGGCCACCTGCCACCAGCG  
ACGGGCTCATGAAGGACTGGACTGGCTGTCCAATCAGCTGGAGCTAG

Human Arf1 mRNA sequence - var3 (public gi: 34527605) (SEQ ID NO: 327)  
AAAACCAACGCCCTGGCTGGAGCAGCAGCCCTTGAGGTGCTCCCTGCCAGTGTCTTCACCTGTCCACA  
AGCATGGGAACATCTCGCAACCTCTCAAGGGCTTTGGCAAAAAGAAATGCGCATCCTCATGG  
TGGCCTGGATGCTGCAGGGAAAGACCACGATCCTCTACAAGCTTAAGCTGGTGGAGATCGTGGACCACCAT  
TCCCACCATAGGCTTCAACGTGGAAACCGTGGAGTACAAGAACATCAGCTTCACTGTGTGGAGCTGG  
GCCAGGACAAGATCCGCCCTGTGGCGCCACTACTTCCAGAACACACAAGGCCCTGATCTCGTGGTGG  
ACAGCAATGACAGAGAGCGTGTGAACGAGGCCGTGAGGAGCTCATGAGGATGCTGGCGAGGAGCAGCT  
CCGGATGCTGCTCTCTGGTGTGCCAACAGCAGGACCTCCCAACGCCATGAATGCCGCCAGATC  
ACAGACAAGCTGGGCTGCACTCACTACGCCAACAGGAACCTGGTACATTCAAGGCCACCTGTGCCACCAGCG  
GCGACGGCTCATGAAGGACTGGACTGGCTGTCCAATCAGCTGCCAACAGAACGTGAACGCCAG  
CTCCCTCTCACTCCTCTGGCCCTGCTTTACTCTCATGTGGCAAACGTGGCTGTGGTGTGAGTGC  
AGAAGCTGCCCTGGTGTGGTGTGGTGTGGTGTGGTGTGGTGTGGTGTGGTGTGGTGTGGTGT  
GCCAGGCTTTATTTAATGAAATAGTTTGTGTTCCAATGAGGAGTTCTGGTACTCCTATGCAAT  
ATTACTCAGCTTTTATGAAAAAGAAAATCAACTCACTGTGAGGAGCTGGTGTGGTGTGGTGTGGTGT  
ATGGGCACCTGGCTCCAGGAGTCGCTGTGGTGTGGAGAGGCCGCCACGCCCTGGCTTAGAGCTGTGTT  
GAAATCCATTGGTGTGGTGTGGTGTGGTGTGGTGTGGTGTGGTGTGGTGTGGTGTGGTGTGGTGT  
CGAGAACACTTGAAACACAGAACAGAGGCCGCCACTAGCATAGATTGCAAGTTACGCCCTGGATGCCAG  
TCGCCAGGCCAGCTGGTGTGCCAACATGAGGTGGTGGCGCAGCAGACTGCCATGCAATTCTGCA  
TGGTCACTGAGAGATCCCCGCACTCGCTGTGCTTGGTGTGGTGTGGTGTGGTGTGGTGTGGTGT

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CCCTGTGCTCCACGGTTCCAGGGGCCAGGCTGGGAGGCCACAGCCACCCACTATGCCGCAGGCCGCC  
CTACCCACCTTCAGGCAGCCTATGGGACGCAGGGCCCCTCTGTCCCTCGTCTGCCGTGGCCAGAGTG  
GGTCCGTCGTCACCACTCGTCTCGCTCAGACACTTCGGCAGGATGTCGGGCTCACCAAGCAGGA  
GCCGCTGCAAGCCGGCAGGGCGTCCACCTAGACCCACAGCCCCCTGGGAGCACCCACCTCTGTGTG  
ATGTAGCTTCTCCCTCAGCTGCAAGGGTCCGATTGCCCCATCGAAAAAGACAACCTCTACTTTTTC  
TTTGTATTTGATAAAACACTGAAGCTGGAGCTGTTAAATTATCTGGGAAACCTCAGAACTGGCTA  
TTGGTGTGCTGGAACCTCTTACTGCTTCAATACAGGATTAGTAATCAACTGTTGTATACTTGT  
CAGTTTCATTCGACAACAAAGCACTGTAATTAGCTATTAGAATAAAACTCTTTAACTATT

Human Arf1 mRNA sequence - var4 (public gi: 6995997) (SEQ ID NO: 328)  
GCAAAACCAACGCCCTGGCTCGGAGCAGCAGCCTCTGGGTGCCCCGGCAGTGTCCCTCCACCTGTCCA  
CAAGCATGGGAACATCTCGCCAACCTCTCAAGGGCTTTTGGCAAAAAGAAATGCCATCCTCAT  
GGTGGGCCCTGGATGTCAGGGAGACCACGATCCTACAAGCTTAAGCTGGGTGAGATCGTGACCACC  
ATTCCCACCATAGGCTCAACGTGGAAACCGTGGAGTACAAGAACATCAGCTCACTGTGTTGGGACGTGG  
GTGGCCAGGACAAGATCGGCCCCCTGTGGCGCAACTACTTCCAGAACACACAAGGCTGATCTCGTGGT  
GGACAGCAATGACAGAGAGCGTGTGAACGAGGCCCCGTGAGGAGCTCATGAGGATGCTGGGCCAGGACGAG  
CTCCGGGATGTCCTCCTGGTGTGCAACAAGCAGGACCTCCCAACGCCATGAATGCCGCCAGA  
TCACAGACAAGCTGGGCTGCACTCACTACGCCACAGGAACGGTACATTCAAGGCCACCTGCCACACAG  
CGGCGACGGGCTATGAAGGACTGGACTGGCTGTCCAATCAGCTCCGGAAACAGAAGTGAACGCCAGCC  
CCCTCCCTCTCACTCCTCTGGCCCTCTGCTTACTCTCATGTGGAAACAGTGGGCTGTGGTGTGAGTG  
CCAGAACGCTGCCCTCGTGGTTGGTACCGGTGTGCATGCCACCGTGTGTAAATGTGGCAGACGCCAGCCT  
GGGGCCAGGCTTTTATTTAATCTAAATAGTTTTGTTCAATGAGGCACTGGTACTCTGTACTCCTATGCA  
ATATTACTCAGCTTTTTTATTGTAAGGAAACATCAACTCACTGTTAGTGTGAGAGGGGATGTAGG  
CCCCATGGGACCTGCCCTCAGGAGTCGCTGTGTTGGGAGAGGCCACGCCCTGGCTAGAGCTGTG  
TTGAAATCCATTTGGTGGTTGGTTAACCCAAACTCAGTGCATTAAAATAGTTAAGAATCCAAG  
TCGAGAACACTGACACACAGAACGGAGACCCGCCAGCATAGATTGCACTGGTACGCCCTGGATGCCA  
GTCGCCAGGCCAGCTGTTCCCTCGGGAAACATGAGGTGGTGGCGCAGCACAGTGCATCAATTCTGC  
ATGGTCACAGTAGAGATCCCCGCAACTCGCTTGTCTTGGTCACTGCATCCATGCCATGTGCTTG  
TCCCTGTGCTCCACGGTTCCAGGGGCCAGGCTGGGAGGCCACGCCACCCACTATGCCGAGGCC  
CCTACCCACCTTCAGGCAGCCTATGGGACGCCAGGCCATCTGCCCCCTGGTCCGCGTGTGGGAGAGTG  
GTCCGTGTCCTCCCAACACTCGTGTCTCGCTAGACACTTTGGCAGGATGTCGGGGCTCAACAGCAGGAG  
CGCGTGCAGGCCAGGGCAGGCGGCCACCTAGACCCACAGGCCCTGGGAGCACCCACCTCTGTGTGA  
TGTAGCTTCTCCTCCCTGAGCTGCAAGGGTCCAGGGTCCATGCCATGAAAAGAACACCTCTACTTTTCT  
TTTGTATTTGTATAAACACTGAAGCTGGAGCTGTAAATTATCTGGGGAAACCTCAGAACACTGGTCTAT  
TTGGTGTGCTAGGAACCTCTACTGCTTCAATACACGATTAGTAATCAACTGTTGTATACTGTTT  
CAGTTTCACTTCGACAAACAAGCACTGTAATTATAGCTATTAGAATAAAATCTCTTAACATT

Human Arf1 mRNA sequence - var5 (public gi: 7020834) (SEQ ID NO: 329)  
CCTTACCCGGCGTCCCCGCGCCGGAGGCCTGACGTGGCCCGTCAGAGCCGCCATTGTGGGAGC  
AAAACCAACGCTGGCTCGGAGCAGCAGCCTCTGAGGTGTCCTGGCCAGTGTCCCTCACCTGTCCACA  
AGCATGGGAACATCTCGCCAACCTCTCAAGGGCTTTGGAAAAAAGAAATGCGCATCCATGG  
TGGGCCTGGATGTCAGGGAAAGACCAAGGATCCTCTACAAGCTTAAGCTGGGTGAGATCGTGACCACCAT  
TCCCACCATAGGCTAACGTGAAACCGTGGAGTACAAGAACATCAGCTTACTGTGTGGGACGTGGG  
GGCCAGGACAAGATCGGCCCCGTGGCCCAACTACTTCCAGAACACACAAGGCTGATTCGTGGTGG  
ACAGCAATGACAGAGAGCGTGTGAAACGAGGCCGTGAGGAGCTCATGAGGATGCTGGCCAGGACGAGCT  
CCGGGATGCTGTCCTCTGGTGTGCAACAAAGCAGGACCTCCCCAACGCCATGAATGCGGCCAGATC  
ACAGACAAGCTGGGCTGCACTCACTACGCCACAGGAACCTGGTACATTCAAGGCCACCTGCGCCACCAGCG  
GCGACGGGCTATGAAGGACTGGACTGGCTGTCAAATCAGCTCCGGAACAGAACGTAACGCGACCCCC  
CTCCCTCTCACTCTCTGGCCCTGTCTTACTCTCATGTGGAAACGTGCGGCTCGTGTGAGTGC  
AGAAGCTGCCCTCGGGTTGGTACCGTGTGCATGCCACCGTGTGTAATGTGGCAGACGCCAGCTGC  
GGCCAGGCTTTTATTAAATGTAATAGTTTTGTTTCCAAATGAGGCAGTTCTGGTACTCTATGCAAT  
ATTACTCAGCTTTTTATTGTAAAAAGAAAAATCAACTCACTGTTCTAGTGTGAGGGGATGTAGGCC  
CATGGGCACCTGGCTCCAGGAGTCGGTGTGGGAGAGCCGGCACGCCCTGGCTTAGAGCTGTG  
TGAAATCCATTGTTGGTTTTAAACCCAAACTCAGTCATTTAAATGTTAAAGATCCTAGG  
TCGAGAACACTGAAACACACAGAACAGGGAGACCCCGCTAGCATAGATTGTCAGTTACGCCCTGGATGCCA  
GTCGCCAGCCAGCTTCCCCCTCGGGAAACATGAGGTGGTGGCGCAGCAGACTGCGATCAATTCTGC  
ATGGTCACAGTAGAGATCCCCGCAACTCGCTTGTCTGGTCACTGCATTCATAGCCATGTGCTTG  
TCCCTGTGCTCCACGGTTCCAGGGCCAGGCTGGGAGCCACAGCCACCCCACTATGCCGCAAGGCCG  
CCTACCCACCTTCAGGCAGCCTATGGGACCGCAGGGCCCCATCTGTCCTCGGTCGGCGTGTGGCCAGAGT  
GGTCCCGTGTCCCAACACTCGTGTGCTCGTCAGACACTTGGCAGGATGTCGGGGCTCACCAAGCAGG  
AGCGCGTGCAGGCCGGCAGGGTCCACCTAGACCCACAGCCCTGGGAGCACCCACCTCTGTGTTG  
GATGTAGCTTCTCTCCCTCAGCCTGCAAGGGTCCGATTGCCATCGAAAAAGACAACCTCTACTTTTT

Figure 36 part - 2

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CTTTGTATTTGATAAACACTGAAGCTGGAGCTTAAATTATCTGGGAAACCTCAGAACTGGTCT  
ATTTGGTGTGGAACCTCTACTGTTCAATACACGATTAGTAATCAAATGTTGTATACTTGT  
TCAGTTTCATTCGACAAACAAGCACTGAATTATAGCTATTAGAATAAAATCTCTTAACATTAAAAA  
AAAAA

Human Arf1 mRNA sequence - var6 (public gi: 10435849) (SEQ ID NO: 330)  
AGCTCAGTGCCACAGCATGTCTGTGGTAGTGTCTAGTCAGGAAGTGAACCTGGCAAAACTGAGTATCACC  
CTCTCTTCCGGTTCTGCCACTCCCTGAAAACCAGGGTAGCATGTACATCAGATAGCTCCGCTAC  
GTGTGCGCTGACCATGCTGAGATGGGACTGTGGACTCAGCTCTGGTCAATTGCTGGAACCAGCGGCC  
CATGTGAGGTACAGGGAAACGCAGTCTAGCAGATGGTTGGATGTGGACACTCGTCTGCCCTCTGGC  
TTGGTGTGTGCCATCGCACAGTCATTGCTGTTAGCATGCATGGGAGAGACTGAAGCACAAGGGCCA  
GGCCCTGGGAGTGCCTGCCCTCAATTGGAAGAGCCCTGGGACAGCATAGGCCCTGGCAGAATTGG  
ACTGGGCCATGATCCAGGGCATTGGGACCTCACCTAGGAGTTGGGTTCTGGTCAAGAGCCCTGTGGAGA  
CAGGGTCTCCCTGTGGGACCAAAACTGACCTCAACTGCTGGTTCTTGGCCCTGGGACAGGGCTGGT  
TGAAGTACTCTCCGGCAGTGTAAATCCCTGCAGGTTCTTATTCTCAGTTGTGTGAGTTCACTGTTGGG  
TCCTCGTGCAGTGTAAATCCCTGCAGGTTCTTCCAGTGGCCAGTCCATCAGCCACTGCACTGGGG  
GCTAATGTGGGTTTGCCTTTGGTCTTGGTTTCCAGTGGCCAGTCCATCAGCCACTGCACTGGGG  
CAGTAGAGGCCAACTGCACCCCTGCCAGAGTAGAAATACTGGTAGGCCAGGCTCTGCTGCCCT  
TCCATGTCTTGTGAAGCATCCATGGACAAAGCTGACTCACGGGGTGTGCACAGCTGCAGGGAGGCCAG  
GAAACAGGGTTTATTCTAGAGGGCCTGTGCTCAGTGACAGACCAGAGTCCCACACTGAGAGAGCAG  
GGCTGGGGCAGCACAAAGACTGGATAGCATTTGCATGATGCCATGTGCACAGCCAGTGCAGTCCTTC  
ATTGTAGCTGTGGTCAGAGGTCACTGAGACACTGCCTCAGCAGCCCTGGGAGTCCACCTGGTGTGCTT  
AGAGCTGTGCATCTGCAAGATTCAGAAGGACTACGTTGGTAGGTGCTTGAAGTAACACTTCACAAA  
TACCAAGAAGCAAGAAATACACAAATAAGCAGGAATAGGTTCTTGGTCTTACATTAGCTAGTGGCAA  
CGGGTCTTGGTCTCACATTAGCTATAGCTCCAGAACACTCAGTCCATGAGGTGGAATCACAATAATGGAA  
TTCATTCTGGCTGTCACTACAAACTGATTTAAGATATCACCTGAATTAAAGCTGACAAACAGTGA  
TCTAAACTGAATTCACTGATTGGCCACCTGAAAGTCAGACCTGATAGATAATGCCCTCCCTTAAC  
AGGGCAGCAGCAGATGTTAGAGGGCACCCTGTGCTCGCAGCCCTCATCTCTAATGGCTGTGGGT  
CACTGTGTGAGTTGAATGCCATAGCTGACCTCTAAACATCCTGAACACTGTTGTAACAGCA  
GACTCCCAGTGGAACTCGCCTCAGATGCAGCCAGAATAAGAGTTCTAGAATGTGTGTGCCATCCTT  
GTCTCAATCTGCATGATGCAAGTCTTCAACATGATTGGTGTGGAGTGTCTCGGTATGTCTT  
CCCCCTGAGCATGCCCTTGTGATCGCACCTGTGTCACAATTGCCCAGCCTGTGAGATGTGTGCTGCTG  
TCACCAGTATCGGCACATTAGTTTCCCTTACGTGAGTTGGTAAATAGTGAACAAATGTAATGCA  
GTGCTCACTGAGAAAATGTCAGGCTCACAGAAATGGAGCATTTGGCTGGTAGCGTGTGACCA  
TAGGCTTATTGGCTGGTGGTAAACAAGCAGCAGCTGTGAGGTGAGAATAATGGCATATTGCA  
TTTCAATTAAAGACTCCCTAAATGAAAATCTCGTGTGGACATGAAACACAGGCTTACGAAATTG  
ATCATCTACACTATATGATGACTGTGAAAGGCTGTTGCTTCTCAGAAATTCTTAAATGTTATGTAAT  
GTACATGAGTCTCTCAGGAAGTATCAGCTTGTGAGTTCTCTCAGAATTAGATAGTAAACTGAGATT  
ATGAACATAAAAGATGTGTAAATTATCTGCACTGAACTTAAATAAAAGCTTTGAAAAAGA  
ACTCTGGGTGGGGTGCATTGGCTCACACACATAGTCCAACTACTGTGGAGGTCAAGGCAGGAGGATCAC  
TGGAGCCCAGACTCAAGATCAGCTGGCAGGAGTAGCGAGACCTGCTATAGAAAATATTAAAATC  
AGCTAGGCATGGTGGCTGCCCTTGCAATTCCCTGCCACTTGGGAGGCTGAGGTGGGAGGTTCGCTTGC  
CCAGGAGCTCAAGGCTGCAATGGCTGTGATGAAACCACACTGAATTCAACCTGGTGCAGAGTGA  
CTGCTCAAAAGAGAACTCTGATGCACTGGCTTCCATGTAAGCAGAGCACATCATGTGAGGCC  
TCGTTGAGTCACTGAGCAGAACAGAATCTGGACCTGGAGCTGTTGCTCTGTGCTAGAGGTTGGAGG  
TGTCTCTGTTCTGTGGTCTGTCAGTCAGGTCACCTAGAGATTCTGTTACATACACCAAGCTCTG  
ACAGGTTGGGGAGATGATCAACCTTCCGCCCTGCCCTGTTCCCTCAGACTGCAAAAGTATCCC  
TGAGATCTGCAAGGGACGGAGGACAGACTGCTGGCTGGTGTGGTACAGGCCACAGAGGATCTGGACC  
CCATGTGCATCTGGCACCTGGTGGATCATTGAGGATGAGGTTGCTGGGAGGTTCTGAGGTT  
CATTTCTCCCTGCCCTGTTCAAGGACACGTCAGGAGGTTGCTGGGAGGTTCTGAGGTT  
GTTCTTGGTGAATGCCATGAGGCAACCTTACCAATTGGTCTGTGGTCTCTCACTGAAGAAAGAACATT  
CTTCCCTAAAGACTTTTCTCAGAGTTGGAGCCCACAGCGTGGTCAAGGAAAGAGAAGTAGCC  
TGGCTCTGGCATCTCTGCTGGCAGGCCCTCTCAAAAGTGTGAGGGTCTCCCTGTGTAAGAAC  
AAGGCTCTGAGAAAGTCAGGTTGCTCTACACAGGATAATTGGATGAAACCTGAAAAGCGGGTTTGG  
CTTGTGTGAGGGACTCTGGTGGAGAAAGGGTACAGCACCTGGCTGGGATGACACAAGTTAGGACC  
CGTACCAAGAGGCCCTGAAATTGAGGGTGGGGGTTGCTGTGACTCTTCTCCCTCTTAGGAAACTCTAT  
TGGTCTCATCTGTCACAGAACAGTAAATGATGTAGGGCTGCCAGGTATAGGGCTCTGTGGGATGC  
TGGAAACATGCCAGGGCAGGACGTGCCAGCCACCCCTGCCCATATGTGAGCAGGCCACAGATGTGCTT  
GTCGGTAGGAGAGACCAAGCTGTCTGTGAGGATGTCATGACACCTGAGACTTCAGGTTACCC  
GGTCTGCCATTCCATTGCAAGGGTGGCTTCCCTCCCTGGGACTCTTAACGCTTTGGTCTGTT  
AAAAA  
CTGATCATCTGAGGTCAAGGGTTGCAAGGGCAGGCCAGCCCTGACCAACATGGTGAACCCCC  
CTCTACT

Figure 36 part - 3

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Human Arf1 mRNA sequence - var7 (public gi: 14714585) (SEQ ID NO: 331)  
CAACGCCCTGGCTGGAGCAGCAGCCTCTGAGGTGCCCCGGCCAGTGTCTTCACCTGTCCACAAGCAT  
GGGGAAACATCTTCGCCAACCTCTCAAGGGCTTTGGCAAAAAGAAATGCGCATTCTCATGGTGGGC  
CTGGATGCTGAGGGAAAGACCACGATCTCTACAAGCTTAAGCTGGGTGAGATCGTGAACCACTTCCA  
CCATAGGCTTCACAGTGAAACCGTGGAGTACAAGAACATCAGCTTCACTGTGTGGGACGTGGTGGCCA  
GGACAAGATCGGCCCCCTGTGGGCCACTACTTCAGAACACACAAGGCTGATCTTCGTGGTGGACAGC  
AATGACAGAGAGCGTGTGAACGAGGCCGTGAGGAGCTCATGAGGATGCTGGCCGAGGACGAGCTCCGGG  
ATGCTGTCTCTGGTGTTCGCCAACAGCAGGCCCTCCCCAACGCCATGAATGCCGAGATCACAGA  
CAAGCTGGGCTGCACTCACTACGCCACAGGAACGGTACATTCAAGGCCACCTGCGCACCAGGGCGAC  
GGGCTCTATGAAGGACTGGACTGGCTGCAATCAGCTCCGGAACAGAACGAGTGAACGCCACCCCCCTCCC  
TCTCACTCCTCTTGCCTCTGCTTACTCTCATGTTGCAAACGCTGCGGCTCGTGGTGTGAGTGCAGAAG  
CTGCTCCGTGGTTGGTCAACCGTGTGCATCGCACCGTGTGCTGAAATGTCAGGACGCCAGCCTGCGGCCA  
GGCTTTTATTAAATGTAATAGTTTGTGGTCAATGAGGCACTTCTGACTCTATGCAATTATTAC  
TCAGCTTTTATTGTAAGGAAACAACTCACTGTTCACTGCTGAGAGGGGATGTAAGGCCATGG  
GCACCTGGCCTCAGGAGTCGCTGTGGAGAGGCCACGCCCTGGCTTAGAGCTGTGGTAAA  
TCCATTTGGTGGTTGGTTAAACCAAACCTCAGTCATTTAAATAGTTAAGAATCCAAGTCGAG  
AACACTTGAACACACAGAAGGGAGACCCGCCACTAGCATAGATTGCACTACGGCCTGGATGCCAGTCGC  
CAGGCCAGCTGTCCTCCCTCGGAACATGAGGTGGTGGCCAGCAGACTGCGATCAATTCTGCATGGT  
CACAGTAGAGATCCCCGCACTCGCTGTCTGGTCACTCGTCAAGGCCATAGCCATGTGCTTGTCCCT  
GTGCTCCACGGTCTCCAGGGGCCAGGCTGGGAGGCCACAGCCACCCACTATGCCAGGCCGCTAC  
CCACCTTCAGGCAGCCTATGGGACGCAGGCCCATCTGCTCCCTCGGTGCCGTGAGTGGTC  
CGTCGTCCCCAACACTCGTGTGCTCAGACACTTGGCAGGATGTCGGGCCCTACCAGCAGGAGCGC  
GTGCAAGCCGGCAGGGCCACCTAGACCCACAGCCCTGGGAGCACCCACCTCTGTTGATGT  
AGCTTCTCTCCCTCAGCTGCAAGGGTCCATTGCACTGGAAACACTCTACTTTTCTTT  
GTATTTTGATAAACACTGAAGCTGGAGCTGTTAAATTATCTGGGAAACCTCAGAAACTGGTCTATTG  
GTGCGTGGAACCTCTTACTGCTTCAATACACGATTAGTAACTGTTGTATACTTGTGTTCACT  
TTCAATTGACAAACAAAGCACTGTAATTATAGCTATTAGAATAAAACTCTTAACATTAAAAAAA  
AAAAAAAAAAAAAAAAAAAA

Human Arf1 mRNA sequence - var8 (public gi: 33872952) (SEQ ID NO: 332)  
GTCCAATCAGCTGGAAACAGAACGAGTGAACGCCACCCCCCTCCCTCACTCTCTGCCCTGCTTTA  
CTCTCATGTGGAAACAGTCGGCTGTGGTGTGAGTGCAGAACGCTGCCCTGGTGTGGTACCGTGT  
GCATCGCACCGTGTGTAATGTGGCAGACGAGCCTGGGCCAGGCTTTTATTAAATGTAATAGTT  
TTGGTCAATGAGGCACTTCTGGTACTCCTATGCAATTACTCAGCTTTTATTGTAAGGAAA  
AATCAACTCACTGTTCACTGCTGAGAGGGGATGTAAGGCCATGGGCACCTGGCCTCAGGAGTCGCTGT  
TTGGGAGAGCCGGCACGCCCTGGCTTAGAGCTGTGTTGAAATCCATTGGTGGTTGGTTAAACC  
CAAACTCAGTCATTTTAAATAGTTAAGAATCCAAGTCGAGAACACTGAACACAGAAGGGAGAC  
CCGCCTAGCATAGATTGCACTTACGGCCTGGATGCCAGTCGCCAGCCAGCTGTCCTCGGGAAACA  
TGAGGTGGTGGTGGCGCAGCAGACTGCGATCAATTCTGCATGGTCACAGTAGAGATCCCCGCAACTCGCT  
TGTCCTGGGTACCCCTGCAATTCCATAGCCATGTGCTTGTGCTCCACGGTCCAGGGCCAG  
GCTGGGAGGCCACAGCCACCCACTATGCCGAGGCCCTACCCACCTTCAGGCAGCCTATGGGACGC  
AGGCCACCTCTGCTCCCTGGTCCGGTGTGGGAGACTGGTCCGTCAGGCCAACACTCGTGTGCT  
CAGACACTTGGCAGGATGTCGGGCCCTCACCGCAGGAGCGCGTGCAGCCGGCAGGCCGTTACCT  
AGACCCACAGCCCTGGGAGCACCCACCTCTGTTGATGTAGCTTCTCTCCCTAGCCTGCAAGG  
GTCCGATTGCCATGAAAAAGACAACCTCTACTTTTCTTTGATAAACACTGAAGCTGGA  
GCTGTTAAATTATCTGGGAAACCTCAGAACTGGTCTATTGGTGTGCAACCTTACTGCTTTC  
AATACACGATTAGTAATCAACTGTTGTATACTGTTTCAGTTTCAATTGACAAACAAGCACTGTA  
ATTATAGCTATTAGAATAAAACTCTTAACATTAAAAAAA

Human Arf1 mRNA sequence - var9 (public gi: 15030200) (SEQ ID NO: 333)  
GAGCCGCCATCTGTGGGAGCAAAACCAACGCCCTGGCTGGAGCAGCAGCCTCTGAGGTGCCCCGGCA  
GTGCTCTCCACCTGTCCAACAGCATGGGAACATCTCGCCAACCTCTCAAGGGCTTTTGGCAAAA  
AAGAAATGCGCATCTCATGGTGGGCTGGATGCTGAGGGAAAGACCACGATCTTACAAGCTTAAGCT  
GGGTGAGATCGTACCGACCACTTCCACCATAGGCTTCAACGTTGAAACCGTGGAGTACAAGAACATCAGC  
TTCACTGTGTGGGACGTGGTGGCCAGGACAAGATCGGCCCTGTGGCCGCAACTTCCAGAACACAC  
AAGGCCGATCTCGTGGTGGACAGCAATGACAGAGAGCGTGTGAACGAGGCCGTGAGGAGCTCATGAG  
GATGCTGGCCAGGAGCAGCTCCGGGATGCTGCTCTGGTGTGCTGCCAACAGAACGGACCTCCCAAC  
GCCATGAATGCCGAGATCACAGAACAGCTGGGCTGCACACTACGCCACAGAACGGTACATT  
AGGCCACCTGCGCCACCGCGGCCAGGGCTCATGAAAGGACTGGACTGGCTGCAATCAGCTCCGGAA  
CCAGAAAGTGAACGCGACCCCCCTCCCTCACTCTCTTGTGCTTACTCTCATGTCGCAACAGT  
GCGCTCGTGGTGTGAGTGCAGAAGCTGCCCTCGTGGTGGTCACTGTCATGCCACCGTGTGTA  
AATGTGGCAGACGAGCAGCTGCCAGGCTTTATTAAATGTAAGTTTGTGTTCAATGAGGAG

Figure 36 part - 4

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TTTCTGGTACTCCTATGCAATATTACTCAGCTTTTATTGTAAAAAGAAAATCAACTCACTGTTAG  
TGCTGAGAGGGGATGTAGGCCCATGGCACCTGGCTCCAGGAGTCGCTGTTGGAGAGCCGGCACG  
CCCTGGCTTAGAGCTGTGTTAAATCCTTTGGTGGTTTTAACCCAAACTCAGTGCATT  
TAAAATAGTTAAGAATCCAAGTCGAGAACACTTGAACACAGAAGGGAGACCCCCCTAGCATAGATT  
GCAGTTACGGCCTGGATGCCAGTCGCCAGCCCAGCTGTTCCCTCGGAAACATGAGGTGGTGGCGCA  
GCAGACTGCGATCAATTCTGCATGGTCACAGTAGAGATCCCCGCAACTCGTGTCTGGTACCCCTG  
CATTCATAGCCATGTGCTTGCTCCCTGTCCTCCACGGTTCGACGGGCGAGCTGGAGCCCACAGCCA  
CCCCACTATGCCGCAAGGCCCTACCCACCTTCAAGGCAGGGCAGGGCCATCTGTTCT  
CGGTCGCGCTGTGGCCAGACTGGTCCGTCGCCCCAACACTCGTGTCTCGCTCAGACACTTGGCAGGAT  
GTCTGGGCCCTACCCAGCAGGAGCGCGTCAAGCGGGGAGCGCTCCACCTAGACCCACAGCCCCCTCGG  
GAGCACCCACCTCTGTGTGATGTAGCTTCTCTCCCTCAGCTCGCAAGGGTCCGATTGCCATCGAA  
AAAGACACCTCTACTTTTCTTGTATTTGATAAACACTGAAGCTGGAGCTGTTAAATTATCTTG  
GGGAAACTCAGAACCTGGTCTATTGGTGTGCGTGGAACCTCTACTGCTTCAATACAGGATTAGTAATC  
AACTGTTTGTATACTTGTGTTCACTGGTCTATTGGTGTGCGTGGAACCTCTACTGCTTCAATACAGGATTAGTAATC  
AAATCTCTTAACTATTAaaaaaaaaaaaaaaa

Human Arf1 mRNA sequence - var10 (public gi: 16553846) (SEQ ID NO: 334)  
GTGGGAGCAAAACCAACGCCCTGGCTCGAGCAGCAGCCTCTGAGGTGCCCCAGTGCCTTCCACC  
TGTCCACAAGCATGGGAACATCTTCGCAACCTCTTAAGGGCCTTTGGCAAAAAGAAATGCGCAT  
CCTCATGGTGGCCTGGATGCTGCAGGGAGACCCAGATCCTCTACAAGCTTAAGCTGGTGAGATCGTG  
ACCACCATCCCACCATAGGCTCAAGTGGAAACCGTGGAGTACAAGAACATCAGCTTACTGTGTGGG  
ACGTGGGGGCCAGGACAAGATCCGGCCCCCTGTGGGCCACTACTTCCAGAACACACAAGGCCATGATCTT  
CGTGGTGGACAGCAATGACAGAGAGCGTGTGAACGAGGCCGTGAGGAGCTCATGAGGATGCTGGCCAG  
GACGAGCTCCGGGATGCTGCTCCTGGTTGCGCAACAAGCAGGACCTCCCAACGCCATGAATCCGG  
CCGAGATCACAGACAAGCTGGGCTGCACTCACTACGCCACAGGAACCTGGTACATTCAAGGCCACCTGCC  
CACCAAGGGCGACGGCTATAAGGACTGGACTGGCTGTCCAATCAGCTCCGGAACCCAGAACG  
.CGACCCCCCTCCCTCACTCCCTCTGCTTTACTCTCATGGCACCGTGTGCAACCTGGCTGTGGT  
TGAGTGCAGAAGCTGCCCTCCGGTTGTCACCGTGTGCACTGGCACCGTGTGTAATGTGGCAGAC  
CAGGCTGGGGCAGGGTTTATTAATGAAATAGTTTTGTTCCAATGAGGAGCTTCTGGTACTCC  
TATGCAATATTACTCAGCTTTTATTGAAAAAGAAAATCAACTCACTGTTCACTGGTGTGAGAGGGGA  
TGTAGGCCATGGGACCTGGCTCAGGAGTCGCTGTGGAGAGGCCACGCCCTGGCTTAG  
AGCTGTGTGAAATCCATTGGTGGTTGGTTAACCCAAACTCAGTGCATTAAAATAGTAAAG  
AATCCAAGTCGAGAACACTTGAACACACAGAAGGGAGACCCGCCCTAGCATAGATTGCA  
GGATGCCAGTCGCCAGCCCAGCTGTTCCCTCGGAACATGAGGTGGTGGCGCAGCAGACTGCGATC  
AATTCTGCATGGTCACAGTAGAGATCCCCCAACTCGCTGTGCTTGGTCACCCCTGCATTCCATAGCCA  
TGTGCTTGTCCCTGTGCTCCACGGTTCCAGGGGCCAGGCTGGAGGCCACAGCCACCCACTATGCCG  
CAGGCCGCTTACCCACCTTCAGGAGCAGCAGGCCCTAGTGGACGAGGCCATCTGCCCCCTGGCGTGTG  
GCCAGAGTGGTCCGTCGTCCCCAACACTCGTGCCTCAGACACTTGGCAGGATGTCGGGCC  
CCAGCAGGAGGCCGTGCAAGCCGGCAGGGCTCCACCTAGACCCACAGGCCCTGGAGCACCCACCT  
CTGTGTGTGATGCTGCTTCTCCCTCAGCTGCAAGGGTCCGATTGCCATCGAAAAGACAAACCTCT  
ACTTTTCTTGTGATTTGTGATAAACACTGAAAGCTGGAGCTGTAAATTATCTGGGAAACCTCTAGA  
ACTGGTCTATTGGTGTGCGGAAACCTTACTGCTTCAATACAGCATTAGTAATCAACTGTTTGAT  
ACTGGTCTTCACTGGGAAACCTCTAGTAAATTAGCTATTAGAATAAAATCTCTTA  
ATT

Human Arf1 mRNA sequence - var11 (public gi: 16553799) (SEQ ID NO: 335)  
 AACCAACGCCCTGGCTCGGAGCAGCAGCCTGTAGGTGTCCTGCCAGTGTCCATTGTCCACAAG  
 CATGGGGACATCTGCCAACCTCTCAAGGGCTTTGGAAAAAGAAATGCGCATCCTCATGGTG  
 GGCCTGGATGCTGCAGGAAGACCACGATCCTCTACAAGCTTAAGCTGGGTGAGATCGTACCCATT  
 CCACCATAGGCTTCAACGTGAAACCGTGAGTACAAGAACATCAGCTTCACTGTGTCGGACGTGGGCG  
 CCAGGACAAGATCCCCCCCCCTGTGGCGCAACTACTTCCAGAACACACAAGGCTGATCTCGTGGGAC  
 AGCAATGACAGAGAGCGTGTGAAACGAGGCCGTGAGGAGCTCATGAGGATGCTGGCGAGGACGAGCTCC  
 GGGATGCTGCTCTCTGGTGTTCGCCAACAGCAGGACCTCCCCAACGCCATGAATGCGGCCAGATCAC  
 AGACAAGCTGGGCTGCACTCACTACGCCACAGGAACCTGGTACATTCAAGGCCACCTGCGCCACCAGCGC  
 GACGGGCTCTATGAAGGACTGGACTGGCTGTCCAATCAGCTCCGAACAGAAGTGAACCGGACCCCCCT  
 CCCCCTCACTCCCTTGCCCTGTCTTACTCTCATGTGGCAAACGTCGGCTCGTGGTGTGAGTGCAG  
 AAGCTGCCCTCGTGGTTGGTACCCGTGTGCACTCGCACCGTGTGAAATGTGGCAGACGCCAGCTGCC  
 CCAGGCTTTTATTAATGTAATAGTTTGTGTTCCAAATGAGGGCAGTTCTGGTACTCTATGCCAATAT  
 TACTCAGTTTTTATTGTAAAAAGAAAATCAACTCACTACTGTTCACTGTGTCAGGAGGGGTAGTAGGCCA  
 TGGGCACCTGGCCTCCAGGAGTCGCTGTGGAGAGGCCAGCAGGGCTTGTGAGGCTGGTGTGAGCTGGT  
 AAATCCATTGGTGGTTGGTTAAACCCAAACTCAGTCATTTTAAATAGTTAAGAATCCAAGTC  
 GAGAACACTGAAACACACAGAAGGGAGACCCGCCAGTGCATAGATTGAGTACGGCCTGGATGCCAGT

Figure 36 part - 5

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CGCAGCCCCAGCTGTCCTCCCTGGGAACATGAGGTGGTGGCGCAGCAGACTGCATCAATTCTGCAT  
GGTCACAGTAGAGATCCCCGCAACTCGCTTGTCTGGTCAACCTGCATTCCATGCCATGTGCTTGTC  
CCTGTGCTCCCACGGTCTCCAGGGCAGGCTGGAGCCCACAGCCACCCACTATGCCGAGGCC  
TACCCACCTCAGGCAGCTATGGGACGCAGGGCCCATCTGTCCTCGGTCGCGTGTGGCCAGAGTGG  
GTCGTCGTCCTCCAAACACTCGTGTGCTCAGACACTTTGCAGGATGTCGTTGGGCTCACAGCAGGAG  
CGCGTCAAGCCGGCAGCGGTCCACCTAGACCCACGCCCTCGGGAGCACCCACCTCTGTCGTTGA  
TGTAGCTTCTCTCCCTCAGCCTGCAAGGTCCGATTTGCCATCGAAAAGACAACCTACTTTTCT  
TTGTATTTGATAAACACTGAAGCTGGAGCTGTTAATTTATCTGGGAAACCTCAGAACTGGTCTAT  
TTGGTGTGTCGTTCAATACACGATTAGTAATC

Human Arf1 mRNA sequence - var12 (public gi: 20147654) (SEQ ID NO: 336)  
ATGGGGAACATCTCGCCAACCTCTCAAGGGCTTTGGCAAAAAGAAATGCCATCCTCATGGTGG  
GCCTGGATGCTGCAGGGAAAGACCACGATCCTACAAGCTTAAGCTGGTGGAGATCGTGCACCACTTCC  
CACCATAGGCTCAACGTGGAAACCGTGGAGTACAAGAACATCAGCTTCACTGTGTGGAGCTGGTGG  
CAGGACAAGATCCGGCCCTGTGGGCCACTACTTCCAGAACACACAAGGCTGATCTGTCGTTGACA  
GCAATGACAGAGAGCGTGTGAACCGAGGGCTGAGGAGCTCATGAGGATGTCGAGGACGAGCTCG  
GGATGCTGTCTCTGGTGTGCAACAGCAGGACCTCCCAACGCCATGAATGCCGAGATCACA  
GACAAGCTGGGCTGCACTCACTACGCCACAGGAACCTGGTACATTCAAGGCCACCTGCGCACCGCG  
ACGGGCTATGAAGGACTGGACTGGTCAATCAGCTGGGAGCTGGTGTGAGTGAAGGAGCTGGGAG  
GCCAGGACAAGATCCGGCCCTGTGGGCCACTACTTCCAGAACACACAAGGCTGATCTGTCGTTG  
CAGCAATGACAGAGAGCGTGTGAACGGAGGCCGTGAGGAGCTCATGAGGATGTCGAGGACGAGCTC  
CGGGATGCTGCTCTCTGGTGTGTCGCAACAGCAGGACCTCCCAACGCCATGAATGCCGAGGAG  
CAGACAAGCTGGGCTGCACTCACTACGCCACAGGAACCTGGTACATTCAAGGCCACCTGCGCACCG  
CGACGGGCTATGAAGGACTGGACTGGCTGCAATCAGCTGGGAACAGCAGGAGCTGGTGTGAGTGC  
TCCCTCTCACTCTCTGGCCCTGTGCTTACTCTCATGTCGCAACAGCTGGGCTCTGGTGTGAGTGC  
GAAGCTGCTCCGTGGTTGGTACCGTGTGTCATCGCACCGTGTGTAATGTCGAGACGCAAGCTGCG  
GCCAGGCTTTTATTAATGTAATGTTGGTCAATGAGGAGCTGGTACTCTCATGCAATA  
TTACTCAGCTTTTATGTAAAAGAAAAATCAACTCATGTCAGTGTGAGAGGGGATGAGG  
ATGGGCACCTGGCCTCCAGGAGTCGTGTGTTGGAGAGCCGGCACGCCCTGGCTTAGAGCTGTGTT  
GAAATCCATTGGTGGTTGGTTTAACCAAACCTAGTCGATTTAAAGTAAGAACATCCAAGT  
CGAGAACACTGAACACACAGAAGGGAGACCCCGCTAGCATAGATTGCACTGGCCTGGATGCCAG  
TCGCCAGCCAGCTGTTCCCTCGGAACATGAGGTGGTGGCGAGCAGACTCGCATCAATTCTGCA  
TGGTCACAGTAGAGATCCCCGCACTCGCTTGTCTGGTCAACCTGCATTCCATGCCATGTGCTGT  
CCCTGTGCTCCACGGTCTCCAGGGCCAGGCTGGAGGCCACGCCACCCACTATGCCGAGGCC  
CTACCCACCTCAGGAGCCTATGGACGCAGGGCCCATCTGTCCTCGGTGGCAGAGTG  
GGTCCGTGCTCCCAACACTCGTGTGCTCAGACACTTGGCAGGATGTCGTTGGCCTCACAGCAGGA  
GCGCGTCAAGCCGGCAGGGCTCACCTAGACCCACAGGCCCTGGGAGCACCCACCTGTGTTG  
ATGTAGCTTCTCTCCCTCAGCTGCAAGGGCTCGATTGGCATCGAAAAGACAACCTACTTTT  
TTTGTATTTGATAAACACTGAAGCTGGAGCTGTTAATTTATCTGGGAAACCTCAGAACTGGTCTA  
TTGGTGTGTCGTTCAATACACGATTAGTAATCAACTGTTGTATCTGTT  
CAGTTTCATTCGACAAACAGACTGTAATTAGCTATTAGAATAAAATCTCTTAACATATT

Human Arf1 mRNA sequence - var14 (public gi: 178982) (SEQ ID NO: 338)  
GGGGAAACCAACGCCCTGGCTGGAGCAGCAGCCTCTGAGGTGTCCTGGCCAGTGTCTCCACCTGTC  
CACAAAGCATGGGAACATCTCGCCAACCTCTCAAGGGCTTTGGCAAAAAGAAATGCCATCCTC  
ATGGTGGCCCTGGATGCTGCAGGGAAAGACCACGATCCTACAAGCTTAAGCTGGTGGAGATCGTGC  
CCATTCCCACCATAGGCTCAACGTGGAAACCGTGGAGTACAAGAACATCAGCTTCACTGTGTGGAGCT  
GGGTGGCCAGGACAAGATCCGGCCCTGTGGGCCACTACTTCCAGAACACACAAGGCTGATCTCGTG  
GTGGACAGCAATGACAGAGAGCGTGTGAAACGAGGCCGTGAGGAGCTCATGAGGATGTCGAGGAG  
AGCTCCGGGATGCTGTCTCTGGTGTGCAACAGCAGGACCTCCCAACGCCATGAATGCCGAG  
GATCACAGACAAGCTGGGCTGCACTCACTACGCCACAGGAACCTGGTACATTCAAGGCCACCTGCGGCC  
AGCGGGGACGGCTCATGAAAGGACTGGACTGGCTGTCAATCAGCTGGGAACAGAAGTGAACCGC  
CCCCCTCCCTCTCACTCTTGTGCTTACTCTCATGTCGCAACAGCTGGCTCGTGTGAG  
TGCCAGAAGCTGCCCTGGTGTGCAACCGTGTGCACTGCCACCGTGTGTAATGTCGAGACG  
CTGGGCCAGGGCTTTTATTAATGTAATGTTGGTTCAGGCTGAGGAGCTGGTACTCTGTT  
CAATATTACTCAGCTTTTATTGTAAGGAAAATCAACTCACTGTTGAGAGGGAGTGA

Figure 36 part - 6

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GGCCCATGGCACCTGCCCTCCAGGAGTCGCTGTGGAGAGCCGCCACGCCCTGGCTTAGAGCTG  
TGTGAAATCATTGGGGTTGGTTAACCAAACACTAGTCATTTAAATAGITAAGAATCCA  
AGTCGAGAACACTGAACACACAGAAGGGAGACCCCGCCTAGCATAGATTGCAGTTACGCCCTGGATGC  
CAGTCGCCAGCCAGCTGCCCCCTCGGAACATGAGGTGGTGGCGCAGCAGACTGCGATCAATTCT  
GCATGGTCACAGTAGAGATCCCCGCACTCGCTTGCTTGGGTCACCCGATTCATAGCCATGTGCT  
TGTCCCCTGTGCTCCCACGGTCCAGGGCCAGGTGGAGGCCACAGCACCACACTATGCCGCAGGCC  
GCCCTACCCACCTCAGGCAGCCTATGGGACGCAAGGCCCATCTGCCCCCTGGCGTGTGGCCAGAG  
TGGTCCGTCGCCCCAACACTCGTCGCTCAGACACTTTGGCAGGATGTCTGGGCTCACCAGCAGG  
AGCGCGTCAAGCCGGGCAAGGGTCCACCTAGAACCCACAGGCCCTCGGGAGCACCCACCTGTGCT  
GATGTAGCTTCTCCTCCCTAGGCTCGATTGCCATCGAAAAAGACAACCTACTTTTT  
CTTTGTATTTGATAAACACTGAAGCTGGAGCTTAAATTATCTGGGAAACCTCAGAACTGGTCT  
ATTTGGTGTCTAGGAACCTCTTAAGCTGCTTCAATACACGATTAGTAATCAACTGTTTGATACTGTT  
TTCAGTTTCATTCGACAAACAAGCACTGTAATTAGCTATTAGAATAAAATCTCTTAACCTATT

Human Arf1 mRNA sequence - var15 (public gi: 3005720) (SEQ ID NO: 339)  
AAACCAACGCCCTGGCTCGAGCAGCAGCCTCTGAGGTGTCCTGGCCAGTGTCTCCACCTGCCACAA  
GCATGGGAACATCTCGCAACCTCTCAAGGCCCTTTGGCAAAAAGAAATGCCATCCATGGT  
GGCCTGGATGCTGAGGAAGACCAAGCAGATCCTACAAGCTTAAGCTGGGTGAGATCGTACCCATT  
CCCACCATAGGCTCAACGGTGGAAACCGTGGAGTACAAGAACATCAGCTTCACTGTGTCGGACGTGGTG  
GCCAGGACAAGATCCGGCCCTGTGGGCCACTACTTCCAGAACACACAAGGCTGATCTCGTGGTGG  
CAGCAATGACAGAGAGCGTGTGAACGAGGCCGTGAGGAGCTATGAGGATGCTGGCGAGGACGAGCTC  
CGGGATGCTGCTCCTGGTGTGCAACAGCAGGACCTCCCAACGCCATGAATGCCGGAGATCA  
CAGACAAGCTGGGGCTGCACTACGCCACAGGAACCTGGTACATTCAAGGCCACCTGGCCACCCAGGG  
CGACGGGCTCTATGAAGGACTGGACTGGCTGCAACTCAGCTCCGGAAACAGAAGTGAACCGGACCCCC  
TCCCTCTCACTCCTCTGGCTCTGCTTTACTCTCATGTCAGGCAAACGTCGGCTCGTGGTGTGAGTGCA  
GAAGCTGCCCTCGTGGTGTGCAACCGTGTGCATGCCACCGTGTCAAATGTCAGGACGCACTGCGG  
CCAGGCTTTATTAATGTAATGTTTGTCTCAATGAGGCACTTCTGGTACTCTATGCAATAT  
TACTCAGCTTTTATTGTAAGGAAACACTCACTCACTGTTCACTGCTGAGAGGGATGTAGGCCA  
TGGCACCTGGCTCCAGGAGTCGCTGTTGGAGAGGCCACGCCCTGGCTTAGAGCTGTGTT  
AAATCCATTGGTGGTTGGTTAACCCAAACACTGTCATTTAAATAGTTAAGAACATCCAAGTC  
GAGAACACTGACACACAGAAGGGAGACCCGCCAGCATAGATTGCACTACGCCCTGGATGCCAGT  
CGCAGCCCAGCTGCTCCCTCGGGAAACATGAGGTGGTGGCGCAGCAGACTGCGATCAATTCTGCAT  
GGTCACAGTAGAGATCCCCGCAACTCGCTGCTTGGTCACTGCATTCATGCCATGTCCTGTC  
CTGTCCTCCACGGTCCAGGGGCCAGGCTGGAGGCCACGCCACCCACTATGCCGCAGGCC  
ACCCACCTTCAGGCAGCCTATGGGACGCAGGGCCCATCTGTCCTCGTGGCCAGGTGGG  
TCCGTCGCCCCAACACTCGTCGCTCAGACACTTGGCAGGATGTCGGGCTCACCAGCAGGAGC  
GCGTCAAGCCGGCAGGGCGTCCACCTAGACCCACGCCCTGGGAGCAGGCCACCCACTCTGTGAT  
GTAGCTTCTCTCCCTAGCCTGCAAGGGTCCGATTGCAAGGAAACCTCTACTTTTCTT  
TTGTATTTGATAAACACTGAAGCTGGAGCTTAAATTATCTGGGAAACCTCAGAACTGGTCTATT  
TGGTGTCTGGAAACCTCTTAAGCTGCTTCAATACACGATTAGTAATCAAAAAAAAAAAAAAAA  
AAA

Human Arf1 protein sequence - var1 (public gi: 3360491) (SEQ ID NO: 223)  
MGNIFANLFKGLFGKEMRILMVGLDAAGKTTIYLKLKLGEIVTTIPTIGFNVETVEYKNISFTVWDVGG  
QDKIRPLWRHYFQNTQGLIFVVDSNDRERVNEAREELMRMLAEDELRAVLLVFANKQDLPNAMNAAEIT  
DKLGLHSLRHRNWYIQATCATSGDGLYEGLDWLSNQLRNQK

Figure 36 part - 7

Unigene Name: ARF5 Unigene ID: Hs.430657

Human ARF5 mRNA sequence - var1 (public gi: 178986) (SEQ ID NO: 340)  
CCAGTTCCAGCCGCACCCCGCTGGTCCCCGCCATGGGCTCACCGTGT  
CCCGCTCTTTCGCGGATCTCGGAAGAACAGCATGGGATTCTCATGGTGGCTGGATGGCGTGG  
CAAGACCAACAATCTGTACAAACTGAAGTTGGGGAGATTGTACCAACATCCCACCCATAGGCTTCAT  
GTAGAAACAGTGGAAATAAGAACATCTGTTCACAGTCTGGGACGTGGGAGGCCAGGACAAGATTGGC  
CTCTGGCGGCACTACTTCCAGAACACTCAGGGCTCATCTTGTTGGACAGTAATGACCAGGAGCG  
GGTCCAAGAACATCTGTGATGAACTCCAGAACAGATGCTGCAGGAGGACGAGCTGCGGGATGCA  
GTGACTGGCTGCCCACGGCTGTCAAAGCGCTAACCGCCAGGGCAGGCCCTGATGCCCGAAGC  
TCTGGACTGGCTGCCCACGAGCTGTCAAAGCGCTAACCGCCAGGGCAGGCCCTGATGCCCGAAGC  
TCCTGCGTGCATCCCCGGGATGACCAGACTCCGGACTCTCAGGCACTGCCCTTCCACTTTCC  
TCCCCCATAGCCACAGGCCCTGCTCTGCTGCCATGTTCTCTGTTGAGGCCCTGGAGGCC  
TTGCTCTCTGGCACAGAGGGTCCACTCTCTGCCGTGGGACCTATGAAAGGGGCTTCC  
GCCCTCTTCAGAGGAGGAGCAGGGATCTGGGTTCTTTCTGTTGGGTGACTCTAGG  
GGCCAGGTTGGAGGGGGAGGTGAGGGCTTCGGTGGCTATAATGTCAGTGGACTGGATCTGAGTAATA  
AATTTGCTGTGGTTTG

Human ARF5 mRNA sequence - var2 (public gi: 21620017) (SEQ ID NO: 341)  
CTCTCTGTGCTGCTGCGCCCATCCCCCGGCCAGTCCAGGCCACCCCGCTCGGTGC  
CCCGCCCCCTCCCCGGGCTCCGCCATGGGCTCACCGTGTCCGGCTCTTTCGCGATCTCGGAAGA  
AGCAGATGCGGATTCTCATGGTGGCTGGATGCGGCTGGCAAGACCACATCCTGTACAAACTGAAGTT  
GGGGGAGATTGTCAACCACATCCCAACCATAGGCTTCATGTAGAAACAGTGGAAATAAGAACATCTGT  
TTCACAGTCTGGGAGCTGGGAGGCCAGGACAAGAGATTGGCCTCTGTGGCCGCACTACTCCAGAACACTC  
AGGGCCTCATCTTGTTGGGACAGTAATGACGGGAGCGGGTCCAAGAACATCTGCTGATGAACTCCAGAA  
GATGCTGCAGGAGGAGGACTGCGGGATGCACTGCTGGTATTTGCCAACAGCAGGACATGCCAAC  
GCCATGCCGTGACGAGCTGACTGACAAGCTGGGCTACAGCACTTACGCA  
AGGCCACCTGTGCCACCCAAAGGACAGGTCTGTACGATGGCTGGACTGGCTGCCACGAGCTGTCAAA  
GCGCTAACCAAGCCAGGGCAGGCCCTGATGCCCGAAGCTCTGCGTCA  
CCCCGACTCCTCAGGCAGTGCCTTCTCCCACCTTCTCCCCATAGCCACAGGCCCTGCTCCTGC  
TCCTGCTGCTGATGTTCTCTGTTGAGGCTGGCTGCTCTGCGCACAGAGGGTCCACTCT  
CCTGCTGCTGGGACCTATGAAAGGGGCTTCTGGCAAGGCCCTCTCC  
TGGGTTCTTTCTGTTGGGTGACTCTAGGGCCAGGTTGGAGGGGAAGGTGAGGGCT  
TCGGGTGGTGTATAATGTCAGTGGACTGGATCTTGAGTAATAAAATTGCTGTGGTTGAAAAAAA  
AAAAAAAAAAAAAAA

Human ARF5 mRNA sequence - var3 (public gi: 12804364) (SEQ ID NO: 342)  
CCCGCGTGGTCCCCGCCCTCCCCGGGCCCCCATGGGCTCACCGTGTCCCGCCTTTCGCG  
ATCTTCGGAAGAACGAGATGCGGATTCTCATGGTGGCTGGATGCGGCTGGCAAGACCACATCCTGT  
ACAAACTGAAGTTGGGGAGATTGTACCAACATCCCAACCATAGGCTTCATGTAGAAACAGTGGAAATA  
TAAGAACATCTGTTCACAGTCTGGGAGCTGGGAGGCCAGGACAAGAGATTGGCCTCTGTGGCCGCA  
TTCCAGAACACTCAGGGCTCATCTTGTTGGGACAGTAATGACGGGAGCGGGTCCAAGAACATCTGCT  
ATGAACTCCAGAACAGATGTCAGGAGGAGCAGCTGGGATGCACTGCTGGTATTTGCCAACAGCA  
GGACATGCCAACGCCATGCCGTGAGCGAGCTGACTGACAAGCTGGGCTACAGCACTACGCA  
ACGTGGTATGTCAGGCCACCTGTGCCACCCAAAGGACAGGTCTGTACGATGGCTGGACTGGCTG  
ACGAGCTGTCAAAGCGCTAACCAAGCCAGGGCAGGCCCTGATGCCCGAAGCTCTGCGTCA  
GATGACCATACTCCGGACTCTCAGGCAGTGCCTTCTCCCACCTTCTCCCCATAGCCACAGGC  
CTCTGCTCTGCTCTGCTGCATGTTCTCTGTTGAGGCTGGCTGCTCTGGCACAGA  
GGGGTCAACTCTCTGCCGTGGGACCTATGAAAGGGGCTTCTGGCAAGGCCCTCTCCAGAGGA  
GGAGCAGGGATCTGGGTTCTCTTCTGTTGGGTGACTCTAGGGCCAGGTTGGAGGGGG  
AAGGTGAGGGCTTCGGTGGCTATAATGTCAGTGGACTGGATCTTGAGTAATAAAATTGCTGTGGTTGAA  
AAAAAAAAAAAAAAA

Human ARF5 mRNA sequence - var4 (public gi: 30583012) (SEQ ID NO: 343)  
ATGGGCTCACCGTGTCCGGCTCTTTCGCGGATCTCGGAAGAACAGCATGGGATTCTCATGGT  
GCTTGGATGCGGCTGGCAAGACCACATCCCTGTACAAACTGAAGTTGGGGAGATTGTCA  
ACCCATAGGCTTCATGTAGAAACAGTGGAAATAAGAACATCTGTTCACAGTCTGGGAGCTGGGAGGC  
CAGGACAAGATTGGCCTCTGTGGGGCACTACTTCCAGAACACTCAGGGCTCATCTTGTTGG  
GTAATGACGGGAGCGGGTCCAAGAACATCTGTGATGAACTCCAGAACAGATGCTGCAGGAGGAC  
GGATGCAGTGCCTGGTATTTGCCAACAGCAGGACATGCCAACGCCATGCCGTGAGCGAGCTGACT

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GACAAGCTGGGCTACAGCACTAACCGCAGCCGACGTGGTATGTCAGGCCACCTGTGCCACCCAAGGCA  
CAGGTCTGTACGATGGTCTGGACTGGCTGTCCCACGAGCTGTCAAAGCGCTAG

Human ARF5 mRNA sequence - var5 (public gi: 6995999) (SEQ ID NO: 344)  
-CCGCGTCGGTCCCCGCCCTCCCCGGGCCCCGCATGGGCCTCACCGTGTCCGCGCTCTTCGCGGA  
TCTTCGGAAGAAGCAGATGCGGATTCTCATGGTTGGATGCGGCTGGCAAGACCAATCTGTGA  
CAAACGTAAAGTGGGGAGATTGTACACCCATCCCACCATAGCTTAATGTAGAACAGTGGAAATAT  
AAGAACATCTGTTACAGTCTGGGACGTGGGAGGCCAGGACAAGATTGGCCTCTGTGGCGGCACTACT  
TCCAGAACACTCAGGGCTCATTTGTGGACAGATAATGACGGGAGCGGGTCCAAGAACATCTGTGA  
TGAACCTCCAGAACAGATGCTGGAGGAGACGAGCTGGGATGCACTGCTGTGGTATTGCAACAAAGCAG  
GACATGCCAACGCCATGGGGTGGAGCAGCTGACTGACAAGCTGGGCTACAGCACTTACGCAAGCCGA  
CGTGGTATGTCAGGCCACCTGTGCCACCAAGGCACAGGTCTGTACGATGGCTGGACTGGCTGTCCCA  
CGAGCTGCTAACAGCTAACAGCCAGGGCAGGGCCCTGATGCCGGAAAGCTCTGCTGCATCCCCGG  
GATGACCAGACTCCGGACTCTCAGGCACTGGCTGGAGCTGGAGCTGGAGCTGGCTCTGGGACAGA  
CTCTGCTCTGCTCTGCCATGTTCTCTGTTGGAGCTGGAGCTGGCTCTGGGACAGA  
GGGGTCCACTCTCTGCCCTGGGACCTATGGAAGGGCTTCTGGCCAAGGCCCTCTCCAGAGGA  
GGAGCAGGGATCTGGGTTCTCTGTTGGGTGACTCTAGGGGCCAGGGTGGGAGGGGG  
AAGGTGAGGGCTCGGGTGGTCTATAATGTGGCACTGGATCTTGAGTAATAATTGCTGTGGTTG

Human ARF5 protein sequence - var1 (public gi: 30583013) (SEQ ID NO: 224)  
MGLTVSALFSRIFGKKQMRILMVGLDAAGTTILYKLKLGEIVTTIPTIGFNVETVEYKNICFTVWDVGG  
QDKIRPLWRHYFQNTQGLIFVVDNSDRERVQESADELQKMLQEDELRAVLLVFANKQDMPNAMPVSELT  
DKLGLOHLRSRTWVYQATCATQGTGLYDGLDWLSHLSKR

Unigene Name: ATP6V0C Unigene ID: Hs.389107

Human ATP6V0C mRNA sequence - var1 (public gi: 33874373) (SEQ ID NO: 345)  
GGTATTAGAGCGCAGGGCTGACGGGCCGGATCGCCCTCGCCGCCGCCCCGCAACCTTCGTGCC  
GGCCCGTCTCGCCCCCGCTCCGCCAACCGCTCGGCCCAGAGCTTGCCCCCTCCCCACCCGAGACA  
TGTCCGAGTCCAAGAGGGCCCCGAGATATGCTTCGTTTCGCGCTATGGCGCCTCGCCGCCATGGT  
CTTCAGCGCCCTGGCGCTGCCTATGGCACAGCCAAGAGCGGTACCGGCATTGCGGCCATGCTGTCATG  
CGGCCGGAGCAGATCATGAAGTCATCATCCCAGTGGTCATGGCTGGCATCATGCCATCTACGGCTGG  
TGGTGGCAGTCTCATGCCAACTCCCTGAATGACGACATCAGCCTCTACAAGAGCTTCCAGCTGGG  
CGCCGGCCCTGAGCGTGGGCCCTGAGCGGCCCTGGCAGCCGGCTTGGCATCGTGGGGAGCGCTGGC  
GTGCGGGGACCGCCCAGCAGCCCCGACTATTCTGTGGCATGATCTGATTCTCATCTTCGCGGAGGTGCG  
TCGGCCTCTACGGTCTCATCTGTGCCCTCATCTCTCCACAAAGTAGACCCCTCCGAGGCCACAGCCA  
CAGAATATTATGTAAGACCACCCCTCCCTATTCCAGAACGAAACAGCCTGACACATACGGCACGGGCCGC  
CGCCCCCAGTAGTTGGCTTGTACATGCGCAGTGTCTAGTGGCCATCGTCTGTTTCCCGGCCCTGGCC  
CCGCCGCCCTGGCGCTGGACATCTGGGCCCTACATCGCCCTCCAGGCCGGCCGGCCCCACCCCT  
AGAGTGTCTCTGTGTATGCGGATGATTAGAATTGTCAATTCTCTTACTGGATGTTATTATAAGATC  
TGGCCTGTTCTCGCTGCGAGCGGCCCTTGCTCTCCAGCTATCTATAACCTTAGCTAGAGTGTGCC  
TTGTGGGTTCTGTGTGAGACTTCCTGGATGGAGCCGCCCTCACCGCCGGCCGTGGCCCTGCCGG  
AGCTGTGTCCAATAAAAGTTCTGGATGTGAAAAAAAAAAAAAAAAAAAAAAA

Human ATP6V0C mRNA sequence - var2 (public gi: 33872390) (SEQ ID NO: 346)  
ggctgacggccggatcgcttcgcggccggccggcggcaaccttgcgtccccggccgtcctcgcccccc  
gcctccggccacggcctcgccccggcagagcttgcggccaccgcagacatgtccgagtccaaagagc  
ggccccggagtagttcggttttcggccgtatggccctcgccgcattgtcttcagcgccctggcg  
ctggctatggcacagccaaagagccgtacccgcattgcggccatgtctgtcatgcggccggagcagatcat  
gaagtccatcatcccagtggctatggctggcatcatcgccatctacggctcggtggcagtcctcatc  
gccaactccctgaatgacgacatcagccttacaagagcttcccgagctggcgccggctgagcgtgg  
gcctgaggccgtggcagccgtttgcctatggcatcggtggggacgctggctgccccgaccggcca  
gcagcccgactatcggtggatgatctgattctcatcttcggccagggtgcgtcgccctacggctc  
atcgctggccctcatctccacaaggtagaccctctccgagccaccagccacagaattatgtaaag  
accacccctccatccagaacgaaacagccgtacacatacgcacggggccgccccagtagtgtgg  
cttgtacatgcgcagtgtcttagtgccatcgctgtttccccggccttgcccccgccggccctgcccc  
tggacatctggcccaactcatcgccctccaggccccggccacccttagagtgcctgtgtatg  
cggatgattagaattgtcatttctttactggatgttattataaagatctggccctgtccctgcgtc

Figure 36 part - 9

PCT/US04/06308

TGCGGAGCGGCCCTGTCTCCAGCTATCTATAACCTAGCTAGAGTGTGCCCTGGGGTCCTGTTGC  
TGAGACTTCCTGGATGGAGCCGCCCTACCGCCGGGGCGTGGCCCTGCCGGAGCTGTCCAATAAG  
TTCTGGATGTGAAAAAAAAAAAAAAATAAAAAAAAAAAAAAAATAAAAAAAAAAAAAAA  
AAAAAAAAAAAAA

Human ATP6V0C mRNA sequence - var3 (public gi: 33873673) (SEQ ID NO: 347)  
CGCCTTCGCCGCCGCCGCCGCCCAAACCTTCGTGCCCGGCCGTCCCGCCCCGCCCTCGGCCACCGCCT  
CGGGCCGCCAGAGCTTGGCCCATCCCCACCGCAGACATGTCCGAGTCCAAGAGCGGGCCCGAGTATGCTT  
CGTTTTTCGCCGTATGGCGCCATGCCCGCCATGGCTTCAGCGCCCTGGCGCTGCCATGGCACAGC  
CAAGAGCGGTACCGGCATTGCCATGTCTGTATGCCCATACGCCATCTACGCCCTGGTGGCAGTCCTCATGCCA  
GTGGTATGGCTGGCATGCCATCGCCATCTACGCCATCTACGCCCTGGTGGCAGTCCTCATGCCA  
ACGACATCAGCCTCTACAAGAGCTTCAGCTGGCGCCGCCGTAGCGTGGGCCGAGCAGCCCCGACTATT  
AGCCGGCTTGGCATCGGATCGTGGGGACGCTGGCGTGGGGCACCGCCAGCAGCCCCGACTATT  
GTGGCATGATCTGATTCTCATCTTCGCCAGGGTGTGCCCTACGGCTCATCGTCGCCATCC  
TCTCCACAAAGTAGACCCCTCCGAGGCCACCAGCCACAGAAATTATGTAAGACCAACCCCTCC  
CCAGAACGAACAGCCTGACACATACGCACGGGGGCCGCCAGTAGTGTGGCTTGTACATGCCAGT  
GTCTAGTGGCCATCGTCTGTTCCCCGCCATGCCGCCAGCGTGGCGTGGACATCTGGGCCA  
CTCATGCCCTCCAGGCCCGGCCGCCAGCCCTAGAGTGTCTGTATGCGATGATTAGAATT  
GTCATTCTCTTACTGGATGTTATTATAAGATCTGGCTTCTCGCTCTGGAGGCGGCCCTTG  
TCTCCAGCTATCTATAACCTTAGCTAGAGTGTGCCCTGGGGTCTGTGAGACTTCTGGATG  
GAGCGCCCTACCGCCGGGGCGTGGCCATGCCA  
AAAAAAAAAAAAAA

Human ATP6V0C mRNA sequence - var4 (public gi: 33990932) (SEQ ID NO: 348)  
GACGGGCCGGATGCCCTTCGCCGCCGCCGCCCAAACCTTCGTGCCGCCGTCCCGCCCCGCC  
CCGCCACGCCCTGGCCCGCAGAGCTTGGCCATCCCCACCGCAGACATGTCCGAGTCCAAGAGCGGCC  
CCGAGTATGCTTCGTTTCGCCATGGCCGATGGCCCATGGCCATGGCTTCAGGCCCTGGCGCTGC  
CTATGGCACAGCCAAGAGCGGTACGGGATGGCCATGGCCATCGCCATCTACGCCCTGGTGGCAGTCCTCATGCCA  
TCCATCATCCCAGTGGTCACTGGCTGGCAGACATGCCATCTACGCCCTGGTGGCAGTCCTCATGCCA  
ACTCCCTGAATGACGACATCAGCCTCTACAAGAGCTTCCAGCTGGGCCGGCCTGAGCGTGGGC  
GAGCGGCTGGCAGCCGTTGCCATGGCAGCTGGGGACGCTGGCTGCGGGCACCGCCAGCAG  
CCCCGACTATTGGGATGATCTCATCTGCCAGGGCCCTGGCCCTACGGCTCTACGGCTCATCG  
TCGCCCTCATCTCCACAAGTAGACCCCTCCGAGGCCACAGAACATATTGTAAGACCA  
CCCCCTCCATCCAGAACGAACAGCCTGACACATACGCACGGGGGCCGCCAGTAGTGTGGCTTG  
TACATGCGCAGTGTCTAGTGGCCATCGTCTGTTCCCCGCCCTGCCCGGCCGGCGTGG  
CATCTGGGCCACTCATGCCCTCAGGCCGGGCCACCCCTAGAGTGTCTGTATGCGGA  
TGATTTAGAATTGTCACTCTTACTGGATGTTATTATAAGATCTGGCTTCTGTGCTGCG  
GAGCGGCCCTGTCTCCAGCTATCTATAACCTTAGCTAGAGTGTGCCCTGTGGGGTCTGTGAG  
ACTTCTGGATGGAGGCCCTACCGCCGGGGCGTGGCCATGCCA  
TGGATGTGAAAAAAAAAAAAAA

Human ATP6V0C mRNA sequence - var5 (public gi: 19913436) (SEQ ID NO: 349)  
GTTCTGCGGTGCTGGTATTTAGAGCCAGCGGCTGACGGGGCGGATGCCCTCGCCGCCGCCGCC  
AACCTTCGTGCCGCCGCCGTCTGCCCTGCCGCCAGGCCCTGCCAGAGCTTGGCCCTCC  
CCACCGCAGACATGTCCGAGTCCAAGAGCGGGCCGAGTATGCTTCGTTTCCGCTCATGGCGCT  
CGGCCGCCATGGCTTCACTGGCCATGCCCTGGCGTGCCTATGCCACAGCCAAGAGCGGTACCGGCATTGCC  
CATGTCTGTATGCCGCCGGAGCAGATCATGAAGTCCATCATCCCAGTGGTCACTGGCTGGCAGATCGCC  
ATCTACGCCCTGGTGGTGGCAGTCTCATGCCAACCTCTGAATGACGACATCAGCCTCTAACAGAGCT  
TCCCTCAGCTGGCGCCGGCCTGAGCGTGGGCCATGCCAGCGGGCTTGCCATGGCATTGCG  
GGGGGACGCTGGCGTGGGGCACGCCAGCAGCCCGACTATTGCGGGCATGATCTGATCTCATC  
TTCGCCGAGGTGCTGCCCTCTACGGTCTCATCGTGCCTCATCTCTCCACAAGTAGACCCCTCTCG  
AGCCCACCGCCACAGAAATTATGTAAGACCAACCCCTCTCATCTCCAGAACGAACAGCCTGACACATA  
CGCACGGGGCCGCCGCCAGTAGTTGGTCTCATGCCAGTGTCTAGTGGCCATGCTGTGTT  
CCCGGCCCTGCCGCCGCCGTGCCGTGGACATCTGGGGCCACTCATGCCCTCCAGGGGGGG  
CGCCCCACCCCTAGAGTGTCTGTGATGAGATTAGAATTGTCACTTCTTACTGGATGTT  
ATTATATAAGATCTGCCCTGTGCCCTGCGTCTGCCAGGGGGCTTGCTCCAGCTATCTATAACCTTAG  
CTAGAGTGTGCCCTGTGGGGTCTGTGCTGAGACTTCTGGATGGAGGCCCTCACGCCGGGG  
TGGCCCTGCCGGAGCTGTGCTCAATAAGTTCTGGATGTGAAAAAAAAAAAAAA  
AAAAAA

Human ATP6V0C mRNA sequence - var6 (public gi: 34534447) (SEQ ID NO: 350)

Figure 36 part - 10

TTTATGCTTGTTCTGCAACTGTTCTGGCCCCACTCTTCTGGCTGAGCCTAGGCCGC  
TCACAGGTCTGCCCTCTGCACTGGCAGGCTGGCCCTGGACTGGAGTCCAGGGTGCATGGTATT  
CCGCTCTGGGGCCATCCCTTCTCCCTGTGCCTCTGGCTCACTTCTGCCTCTGGGGACTACTGCCACATGA  
TTCTCCTGCTGCCCTGTAGAAAAGGGCCTGGCTCACTTCTGCCTCTGGGGACTACTGCCACATGA  
GGGTCACACTTGGTTGCTGAGITCCCTGTATTCACTGCCTGCCAACGTGCTGCCATGCTGGTC  
TCTTGCAATGATGCACTGGATGTGGCTCTGGGCTGCACTGGAGCTGGACAGGCCAGGG  
ATTGCTCTATATGCTGCCAGGAAAAAAATGCACTGTAACCAGAGTCAAGACAGGCCAGGG  
CCTGGGCCAGTCTGCAGGTGCACTGGGTGTCAGGATGCTGGCACCTCCAGGGTGGCTGGA  
GGAGGCCAGTCTGCCAGGCTCAAGCTCCCTCCAGGCTATAGTCACTCCCTGGATAACCC  
AGCAGCGTCTGGGTGCTGCACTGGGCTGCAAGGTGCTATCCAGAGCCCTGTCTTATTGCCCTGTTCTGTG  
ACTCCTCTCCGCCAACCTGGGACTTGTCTGTGAAGGCCCTCCCAGCACCCCTCTCCGCTCTC  
CTGGAGCATGTCCTGTGCCTGGAGGTCAACGCCCTGTGCTCTCACCCCTGCTGAGTGCCTGGGACACAG  
GGTAGGCAAGTTTGTGGCCAAATATATCAATAAAATATGAAGAGGAATGGTAGGGTAGTCCCTGGTCC  
CTTCCACCTGACATATGAGTCTTGCAAGGTGCTGGTGTGTGTGTGTGTGT  
GTGTGTGTGTCTGTCAAGAGATTCACTCTGTTGTTGAGACGGAGTCTCTGTGTGCCAGG  
CTGGAGTGCAGTGGCGTGAATCTGACTCACTGCAACCTCAACTCTGGGTCAGGCCATTCTCCGCTC  
AGCCTCCCTAGTAACGGGATGACAGGCATGCCAACACTCTGGCTAATTGGTATTAGAG  
ACGAGGTTTCAACATGTTACCCAGGCTAACATCTGCAACTCGGATCACCTGAGGTCAAGGAGTGGAGACCA  
GCCAGGCAACATGGGAAACCCATCTACTAAACAAAGGATTAGCCAGGTCTGGTGGCG  
TGCTGTAACTCCACCTACTGGGAGGCTGAGGAGGAAACTTGAGACCCAGGAGGAGGTTACA  
GTGAGCCGAGATCGGCCACTGCACTCCACCTGGGAAACAGAGCGAAAAGTCTCAAAAAAAAAA  
AAAAAATTTTCAATTGAGGTATTCTTCACTGAGGTTAGTAAGTTTAATGAAACCAATTAAATT  
ACACTTCCAGAAAATAGATGACATCAGTGCCTTGCTACTTCTCAGTCCTCACTATTGCTTGAGGG  
CCCAGGTACTGAAACTGGTGTCTGAGTTTGTCAGCTTTCTCCAGTCCATTATCCCCCTCCCT  
GCTCTGAAGCAGTCTAGGTTAAACTAGCCAGGGAGGTAGTTGGAAGTGGATTCAAAGGCCAC  
TTTAGAGATCAGGCCACAGCTTTTATATCGCACAGGACACATCAGCTGAGCTGCTCATGCTGT  
TTCCCCAGGAACCTCACTCTTGGTAGAACCTGGGATTAGAAATTGGCTTCCATAACTCATT  
TACTCCAACAGTTGAAGTTACACACATTGCTCCAAATTGAAATAGACACAGTACCTTACCTTCA  
TCCCCATCTGGCTTTACTTCTTGTCTCAGTGGTGGAAACAGTGGCCATTCAAAGTATAGTAGAT  
TTCACACTCACAAATGACAAGTCCATTAACTAGGAAGGCCACAAATTCACTGAGTCTGACTGCTG  
CAGGGCGGCTGCACTGGAGGCCAGGGCAGCCCTGCTCACTGAATGAGTCTGAGTGTGACTGCTG  
CCCGCAGTGTGAACATGCCCAACGCCAGGCCAGCACTGCTTGGGTCA

Human ATP6V0C mRNA sequence - var7 (public gi: 30583148) (SEQ ID NO: 351)

ATGTCGGAGTCCAAGAGCGGCCCGAGTATGCTCGTTTCGCCATGGGCCCTCGGCCATGG  
TCTTCAGGCCCTGGCGCTGCCATGGCACAGCAAGGCCAGGGTACCGCATTGCCATGCTGT  
GCCCGGGAGAGCATGAAAGTCCATTCACTCCAGTGGCATGGCTGCCATCGCCATCAGGCC  
GTGGTGGCAGTCTCATGCCAACCTCTGAATGACGACATCAGCTCTACAAGAGCTTCCAGCTGG  
GCCCGGCCCTGAGCGTGGCTGAGGCCCTGGCAGCCGGTTGCCATGGCATCGTGGGGACGCTGG  
CGTGGGGCACGCCAGCAGCCCCACTATTGTTGGCATGATCCTGATTCTCATCTGCCAGGTG  
CTCGCCTCTACGGTCTACGTCGCCCTCATCTCTCCACAAAGTAG

Human ATP6V0C protein sequence - var1 (public gi: 30583149) (SEQ ID NO: 225)

MSESKSGPEYASFFAVMGASAAMVFSALGAAYGTAKGSGTGIAMMSVMRPEQIMKSII  
PVVMAGIIAIYGLVVAVLIAINSLNDISLYKSFQLQGAGLSVGLSLAAGFAIGIVGDAGVR  
GTAAQQPRLFVGMLILIFAEVLGLYGLIVALILSTK

Human ATP6V0C protein sequence - var2 (public gi: 34534448) (SEQ ID NO: 226)

MILPAALCRKGPGSLPASGGLLASQGPLLGLLSSLYSVSCQRVCHALVSCAYMMQLDV  
VLGLQWEPPKMH CNCSCILPGKKTCTVTRSSGQALQALGPSLQVHWVLA  
WHVWAPPGRGGRVAPWPRSQPPSSLYSHSLDTQHRLGCLRCY  
PEPLSYCLVFL

Human ATP6V0C pray sequence - var1 (SEQ ID NO: 352)

CCGCCATGGAGTACCCATACGACGTACCAAGATTACGCTCATGGCCATGGAGGCCAGTGAATT  
CCACCAAGCAGTGGTATCAACGCCAGAGTGGCATTGGGGGCTGCGGTGCTGGTATT  
TAGAGCGCAGCGGCTGACGGCCGATGCCCTGCCTGCCGCCGCAACCT  
TCGCCCCGCCCTGGCCCTGCGCTCTGCCCTCGCCCCGCC  
CGCCACGCCCTGGCCCGCAGAGCTTGGCCCTCCCCCATGTC  
GGCCGCTCGGCTCTAGAGGGTGGCAGATGAACTGAGATA  
CTCAACTGTGCATTGCA

Unigene Name: CBLB Unigene ID: Hs.3144 Clone ID: 3GD\_114

Human CBL-B mRNA sequence - var1 (public gi: 4757919) (SEQ ID NO: 353)

CTGGGTCCCTGTTGCCCCACAGGGGGGGTGTCCAGCGAGCGGTCTCCCTCTGCTAGTGCTGCTGC  
GGCGTCCC CGCCTCCCGAGTCGGCGGGAGGGGAGAGCGGGTGTGGATTGCTTGA CGTAATTGT  
TGGCTTCCACGTCTGGAGGCCCTGCGCTGGGTGCTCTTCTCGGGAGCGAGCTGTTCTCAGCGAT  
CCCAC TCCCAGCGGGCTCCCCACACACTGGGCTGCGTGTGGAGTGGGACCCGCGCACACGCG  
TGTCTCTGGA EAGCTACGGCGCCGAAAGA ACTAAAATTCCAGATGGCAA ACTCAATGAATGGCAGAAACC  
CTGGTGGTGCAGGGAGGAATCCCCGAAAAGGTGCAATTGGGTATTATGATGCTATTCAAGGATGCAGT  
TGGACCCCTAAGCAAGCTGCCGAGATCGCAGGACCGTGGAGAAGACTTGGAGCTCATGGACAAAGTG  
GTAAGACTGTGCCAAAATCCAAACTTCAGTTGAAAAAATAGCCCACCATATAACTTGATAATTGCTG  
ATACATATCAGCATTACGACTTATATTGAGTAATATGATGACAACCAGAAAACTTGCCCAACTCAGTGA  
GAATGAGTACTTAAATCTACATTGATAGCCTTATGAAAAGTCAAAACGGGCAATAAGACTCTTAAA  
GAAGGCAAGGAGAGAATGTATGAAGAACAGTCACAGGACAGCAGAAGCAGAAAATCTCACAAAATCT  
TCAGTCACATGCTGCCAGGAATCAAAGCAATCTTCCAATGGTCAATTCCAGGGAGATAACTTCGTAT  
CACAAAAGCAGATGCTGTAATTCTGGAGAAAAGTTCAGGAGACAAAATCTGTAACATGGAAAGTA  
TTCAAGACAGTGGCTTATGAGGTCCACAGATTAGCTCTAGGCTGGAAAGCAATGGCTCTAAAATCAACAA  
TTGATTAACTGCAATGATTACATTCAAGTTGAAATTGATATTTCACCAAGGTGTTTCAAGCCTG  
GGGCTCTATTTCGGGAATTGGAATTCTTAGCTGTGACACATCCAGGTACATGGCATTCTCACATAT  
GATGAAGTAAAGCAGCACTACAGAAATATAGCACCAAACCCGGAGCTATATTTCGGTTAAGTGCA  
CTCGATTGGGACAGTGGGCATTGGCTATGTGACTGGGATGGGAATATCTACAGACCACCTCATAA  
CAAGCCCTTATTCAAGCCCTGATTGATGGCAGCAGGGAGGATTATCTTATCCTGATGGGAGGAGT  
TATAATCCTGATTTAACTGGATTATGTGAACCTACACCTCATGACCATAAAAAGTACACAGGAACAAT  
ATGAATTATATTGTGAAATGGGCTCCACTTTCACTGCTGTAAAGATTGTCAGAGAATGACAAGATGT  
CAAGATTGAGCCTTGTGGCATTGATGATGTCACCTCTTGCCTTACGGCATGGCAGGGTGGGATGGTCAG  
GGCTGCCCTTCTGCTGTTGTGAAATAAAAGGAACTGAGCCCATATACTGTTGAGACCCCTTGTCAAGAG  
ATGAAGGCTCCAGGTGTTGCACTATTGACCCCTTGGCATGGCGATGCTAGACTTGGACGACGATGA  
TGATCGTGGAGGAGTCCTTGTGATGATGAACTGGTTGGCAAAAGCTGGCAACTGACAGGCAAGACTCA  
CCAGTCACATCACCAGGATCCTCTCCCTTGGCATGGCGATGCTAGACTTGGACGACCCACTCCAGATCC  
CACATCTAACGCTGCCACCCGTGCCTCTCGCTGGATCTAATTCAAGAACGGCATAGTTAGATCTCCCTG  
TGGCAGCCCAACAGGTTCAACAAAGTCTCTTGCATGGTGGAGAAAACAAGATAAACCAACTCCAGCA  
CCACCTCTCCCTTAAGAGATCCTCTCCACCGGCCACCTGAAAGACCTCCACCAATCCCACCAAGACAATA  
GACTGAGTAGACACATCCATCTGAAAGCGTGCCTTCCAGAGACCCGCAATGCCCTTGAAGCATG  
GTGCCCTGGGATGTGTTGGACTAATCAGCTTGTGGATGTCACTCTAGGGGAGGGCTCTCCAAAA  
CTTGAATCACAGCGAGTTCAATGTCATGGAGGCAACAGTAGAGTGGCTCTGACCCAGTGTCTATGC  
GGAAACACAGACGCCATGATTGCTTGAAGGAGCTAAGGTCTTCCAATGGTACCTTGGAAAGTGA  
AGAATATGATGTTCTCCCCGGTTTCTCTCCCTCCAGTTACCACTCCCTAGCATAAAAGTGT  
ACTGGTCCGTTAGCAAATTCTCTTCAAGAGAAAACAAGAGACCCAGTAGAGGAAGATGATGATGAATACA  
AGATTCCTTCATCCCACCCCTGTTCCCTGAAATTCAACCCATCTCATTGTCATAATGTAACCTCTGT  
TCGGCTCTGTGATAATGGTCACTGTATGTAATGGAAACACATGGTCCATCTCAGAGAAGAAATCAAAC  
ATCCCTGACTTAAGCATATAATTAAAGGGTACGTATAGAATATAATTCTCTTGTGATGATGATCTTAAT  
GGTCAGAATTAAAGGCAAATTCTAGCCATTGACTGAAATACATTAGGTTTGTGTTATCCTCTA  
GGAGATGTTTGTGATTCAGCCTCTGATCCCCTGCCATTACCACTGCCAGGGCTCCAACCGGGACAATC  
CAAAGCATGGTCTTCACTCAACAGGACGCCCTGATTATGATCTCTCATCCCTCATTAGGTTGAAA  
CCTTAAAAAAAGTTTGAACAACCCACCCCTCTTAAATTCAAGAATTTCAGAATTCAAGAGTTCA  
GTATAACACAGACTCACTGGTTGTGAATTGCTGAAATTGAATGGGCTCCAGGTGCCGGTGA  
CCAAGTTCACGAGACCAATTACTCCATGAGATGATGATGAGTGTAGTAGTGTAGTTGGCATTAGTCAGG  
TTTAAGCAAGTTGTTGTCCATAACTAAATGTAGTCTAAAACACATGAGAGCTTGTGCTTAGTGT  
TTGAAGTGTGACTTGAAGTGTGAGATTCTTAAAGTATAATAATTCTTAATAATGAACTTGCT  
TTCTTGACGATGAGCACCAAGTCCACTTACGCTAATTAAATTATGCAAATTAATAGTGTAG  
AGAACTGATAATAAAATTCTGTTTATTCTAATCATTACAACACTGTAACACATTCAAAAAAAAAA

Human CBL-B mRNA sequence - var2 (public gi: 23273908) (SEQ ID NO: 354)

AGCGGAGTGTGCTGCCGCGTCCCGCGGCCCTCCCCGAGTCGGCGGGAGGGAGAGCGGGTGTGGATTG  
TCTTGACGGTAATTGTTGCCATTCCACGCTCTCGAGGCCCTGCCGCTGGGTTGCTCTTCTCGGGAGCG  
AGCTGTTCTCGCGATCCACCTCCAGGCCGGCTCCCCACACACTCGGCTGCCGTGCTGGAGTGG  
GACCCGCCACACCGCTGTCTCGACAGCTACGGCGCCGAAAGAACTAAATTCCAGATGGCAAACCTCA  
ATGAATGGCAGAAACCCCTGGTGGTCAAGGAGGAAATCCCCGAAAAGGTGCAATTGGGTATTATGATG  
CTATTCAAGGATGCACTGGGACCCCTAAGCAAGCTGCCAGATCGCAGGACCGTGGAGAAGACTTGGAA  
GCTCATGGACAAAGTGGTAAGACTGTGCAAATCCCAAACCTTCAGTTGAAAGGATAGCCCACCATATA  
CTTGATATTTCGCTGATAACATATCAGCATTACGACTTATATTGAGTAAATATGATGACAACCAAGAAAC  
TTGCCCAACTCACTGAGAATGAGTACTTAAATCTACATTGATAGCCTTATGAAAAGTCAAACCGGGC  
AATAAGACTCTTAAAGAAGGCAAGGAGAGAATGTATGAAAGAACAGTCACAGGACAGACGAAACTCACA

AAACTGTCCCTTATCTTCAGTCACATGCTGGCAGAAATCAAAGCAATCTTCCAATGGTCATTCAGG  
GAGATAACTTCTGATCACAAAGCAGATGCTGCTGAATTCTGGAGAAAGTTTTGGAGACAAAACAT  
CGTACCATGGAAAGTATTCAAGACAGTGCCTTCATGAGGTCCACCAGATTAGCTCTGGCTGGAAAGCAATG  
GCTCTAAATCAACAATTGATTTAACITGCAATGATTACATTTCAGTTTGATATTGATATT  
GGCTGTTTCAGGCTGGGCTTATTTGCGAATTGGAAATTCTTAGCTGTGACACATCCAGGTACAT  
GGCATTTCTCACATATGTAAGTAAAGCACGACTACAGAAATATAGCACCAACCCGGAAAGCTATATT  
TTCCGGTTAACGACTCGATTGGGAGCTGGGCTATGGCTATGTGACTGGGATGGAAATATCTTAC  
AGACCATACCTCATAAAGCCATTTCAGGCTGATTGATGGCAGGGAAAGGATTTTATCTTAA  
TCCTGATGGGAGGAGTTATAATCCTGATTAACTGGATTATGTGAACCTACACCTCATGACCATAAAA  
GTTACACAGGAACAATATGAATTATTTGTAATGGGCTCCACTTTCAAGCTCTGTAAGATTTGTGCAG  
AGAATGACAAAGATGTCAGAATTGACCCCTGTGGCATTGATGTGCACCTCTGCCAACGGCATGGCA  
GGAGTCGGATGGTCAGGGCTGCCCTTCTGTGTTGAAATAAAAGGAACGTGAGCCATAATCGTGGAT  
CCCTTGATCCAAGAGATGAAGGCTCAGGTGTTGACGATCATTGACCCCTTGGCATGCCGATGCTCG  
ACTTGGACGACGATGATGTCAGGAGTCCTGATGATGAACTGGTTGCAAACGTCGAAAGTGCAC  
TGACAGGCAACTCACCAGTCACATACCAGGATCCTCTCCCCITGCCAGAGAAAGGCCACAGCCT  
GACCCACTCCAGATCCCACATCTAACGGCTGCCACCGGTGCCCTCGCTGGATCTAATTGAGAAAGGCA  
TAGTTAGATCTCCCTGTGGCAGGGTACCCAAAGGATCTCCCTGGATCTAATTGAGAAAGGCA  
TAAACCACTCCCAGCACCCATCTCCCTTAAGAGATCTCCCTCCACCGGACACTGAAAGACCTCCACCA  
ATACCCAGAGAAATAGACTGAGTAGACACATCCATCTGAAAGGAGCTTACCGCCAA  
TGCCCTTGTGAAGCATGGTCCCTCGGATGTTGGACTAATCAGCTGTGGATGTCACCTCTAGG  
GGAGGGCTCTCCTGGAAATCACAGCAGTCAATGGAAGGACAGTAGAGTGGCTCT  
GACCCAGTGCTATGCGGAAACACAGACGCCATGATTGCTTCTAGAAGGGAGCTAAGGTCTTCCAATG  
GTCACCTTGGAAAGTGAAGAATATGATGTTCTCCCGGCTTCTCCTCCAGTTACCAACCCCTCCT  
CCCTAGCATAAAAGTGTACTGGTCCGTAGCAAATTCTCTTCAAGAGAAAACAAGAGACCCAGTAGAGGAA  
GATGATGATGAATACAAGATTCTCATCCACCCCTGTTCCCTGAATTCAACACATCTCATTGTCATA  
ATGAAAACCTCTGTGTTGGCTTGTGATAATGGTCACTGATGTCATGGAACACATGGTCCATCTC  
AGAGAAGAAATCAAACATCCCTGACTTAAGCATATATTAAAGGGAGATGTTTTGATTGAGCTTAC  
CCCCGTGCCATTACACCTGCCAGGCCCTCAAACGGGACAATCCAAGGATGGTCTTCACTCAACAGGA  
CGCCCTCTGATTATGATCTCTCATCCCTCCTGGATAGGTGAAGATGTTGATGCCCTCCATCT  
CCACCTCCCCACCTCTGCAAGGCTAGTCTATTGACACATTCAAAACCTCTGGCTCCAGTAGCCGG  
CCATCCTCAGGAGCAGGATCTTTCTCTCTGGATCCCTGAGATCCCTGGTGTAGCAAGTGGCCAGTTC  
CTTGCCCTCCCTAGAAGGTTACCGGTAAAATGTCAAAACACTAACAGAACATCACAGGACTATGATCA  
GCTTCCTCATGTTAGATGGTCAACAGGCACAGCCAGACCCCTAAACCAACGCCGCGCAGGACTGCA  
CCAGAAATTCAACCACAGAAAACCCATGGGCTGAGGGGGCATTGGAAAATGTCATGAAAAATTGCAA  
AACTCATGGGAGAGGGTTATGCTTGAAGAGGTGAAGAGAGCCTTAGAGATAGCCAGAATAATGTCGA  
AGTGCCCGGAGCATCTCCGAGAATTGCTTCCCTCCAGTATCCCCACGTCAAATCTATAGCAG  
CCAGAACTGTAGACACAAAAATGGAAGCAATGATGATTCAAGAGTGTGGAAATAAGAGAAACTGAG  
ATGGAATTCAAGAGAGAAGTGTCTCTCTGTCAGCTTGAGAAGAGGCTGGGAGTGCAGCTTCT  
CAAAGGAGACCGATGCTGCTCAGGATGTCAGCAGCTGTGGCTCCCTGTTTGCTAGCCATATT  
AATCAGGGTTGAACTGACAAAAATAATTAAAGACGTTTACTTCCCTGAACTTGAACCTGTGAAATG  
TTTACCTTGTITACAATTGGCAAAGTGCAGTTGTTCTTCAAGGTTTACTTCAAGGTTTGTGTT  
TGATACCTGTACTGTGTTCTTCAGACAGGCCCTTGTAGCGTGGCTCAGGTCTGCTGTAACATT  
CTCTTGTGTCACATCACACAGCTTCAAGGTTCTGATGTTCAACTGATCAAAC  
CAGGTCCAGTTCTCATTCAACAGATGCTTGAAGGTTCTGATTTCAACTGATCAAAC  
GCAAAAAAAAAAGTATGATTCTTCACTACTGAGTTCTTGGAAACCATCACTATTGAGAGATGG  
AAAAACCTGAATGTATAAAGCATTGTCATAAAACTGCCCTTGTAAAGGGTTTCACAAAAAAA  
AAAAAAA

Human CBL-B mRNA sequence - var3 (public gi: 862406) (SEQ ID NO: 355)  
CTGGGTCCCTGTGTGCCACAGGGGGGGGTGTCAGCGAGCGGTCTCCCTCCCTGCTAGTGCTGCTGC  
GGCGTCCCGGGCCTCCCCGAGTCGGGGGGAGAGGGAGAGCGGGGTGTGGATTGCTTGACGGTAATTGT  
TGGCTTCCACGTCTCGGAGGCCCTGGCGCTGGGTTGCTCTTCTCGGGAGCGAGCTGTTCTAGCGAT  
CCCACCTCCCAGCCGGGGCTCCCCACACACACTGGCTCGTGTGGAGTGGGACCCGCGCACACGCG  
TGTCTCTGGACAGCTACGGCGCGAAAGAACCTAAATCCAGATGCCAAACTCAATGAAATGGCAGAAACC  
CTGGTGGTCAGGGAGGAATCCCCGAAAAGGTCGAAATTGTTGGTATTATGATGCTATTCAAGGATGCA  
TGGACCCCTAAGCAAGCTGCCAGATCGCAGGACCGTGGAGAAGACTGGAGCTATGGACAAAGTG  
GTAAGACTGTGCCAAATCCCAAACCTCAGTTGAAAAAATAGCCACCATATATACTGATATTGCTG  
ATACATATCAGGATTTACGACTTATGAGTAATGATGACAACCAAGAAAATGGCCAACTCAGTGA  
GAATGAGTACTTTAAAATCACATTGATGACGCTTATGAAAAGTCAAAACGGCAATAAGACTCTTAAA  
GAAGGGCAAGGAGAGAATGTATGAGAAGAACAGTCACAGGACAGCAGAAATCTCACAAA  
ACTGTCCCTTATCT  
TCAGTCACATGCTGGCAGAAATCAAAGCAATCTTCCAATGGTCATTCCAGGGAGATAACTT  
CACAAAAGCAGATGCTGTAATTCTGGAGAAAGTTTTGAGACAAAACATCGTACCATGGAAAGTA  
TTCAGACAGTGCCTCATGAGGTCCACCAAGATTAGCTCTAGCCTGGAAAGCAATGGCTCTAAACAA

Figure 36 part - 13

PCT/US04/06308

Human CBL-B mRNA sequence - var4 (public gi: 862408) (SEQ ID NO: 356)  
CTGGGTCTGTGTCGCCACAGGGTGGGGTGTCCAGCGAGCGGTCTCCTCCCTGCTAGTGCTGCTGC  
GGCGTCCC CGGGCTCCCCGAGTCGGGGGGAGGGAGAGCGGGTGTGGATTTCGCTTGA CGGTAAATG  
TGCCTTCCACGTCCTGGAGGCTCGCGCTGGGTTGCTCCCTCTCGGGAGCGAGCTGTTCTCAGCG  
CCCACCTCCAGCGGGCTCCCCACACACACTGGGCTCGCTGCGTGGAGTGGGACCCGCACACCG  
TGTCTCTGGACAGCTACGGCGCCGAAAGAACTAAAATCCAGATGGCAAACCTCAATGAATGGCAGAAC  
CTGGTGGTCGAGGAGGAAATCCCCGAAAGGTCGAATTGGGTATTATTGATGCTATTAGGATGAGT  
TGGACCCCTAACGCAAGCTGCCAGATGCCAGGACCGTGGAGAAGACTTGAAGCTCATGGACAAAGTG  
GTAAGACTGTGCCAAATCCAAACTTCAGTTGAAAAATAGGCCACCATATACTTGATATTGCTG  
ATACATATCAGCAATTAGCACTTATATTGAGTAAATATGATGACAACCAGAAACTTGCCAACCTCAGTG  
GAATGAGTACTTAAATCTACATTGATAGCCTTATGAAAAGTCAAAAGGGCAATAAGACTCTTAA  
GAAGGCAAGGAGAGAATGTATGAAGAACAGTCACAGGACAGACGAAATCTCACAAAAGTCCTTATCT  
TCAGTCACATGCTGCCAGAAATCAAAGCACTTTCCCAATGGTCAATTCCAGGGAGATAACTTCG  
CACAAAAGCAGATGCTGCTGAATTCTGGAGAAAGTTTTGGAGACAAAATATCGTACCATGGAAAGTA  
TTCAGACAGTGCCTTCACTGAGGTCCACCAAGTAGCTCTAGCCTGGAAAGCAATGGCTTAAATCAACAA  
TTGAGTTAACCTGCAATGATTACATTTCAGTTGATATTGATATTTCACCGGCTGTTCA  
GGGCTTAACTTGCAGATTGGAAATTCTAGCTGTGACACATCCAGGTTACATGGCATTCTC  
GATGAAGTTAAAGCAGCACTACAGAAATATAGCACCACCCGGAAAGCTATATTTC  
CTCGATTGGGACAGTGGGCCATTGGCTATGTGACTGGGGATGGGAATATCTACAGACC  
ACACCTCATAA

Figure 36 part - 14

CAAGCCCTTATTCAAGCCCTGATTGATGGCAGCAGGGAAAGGATTTATCTTATCCTGATGGGAGGAGT  
 TATAATCCTGATTAACCGATTATGTGAACCTACACCTCATGACCATAAAAGTTACACAGGAACAAT  
 ATGAATTATATTGTGAAATGGGCTCCACTTTCAGCTCTGTAAGATTGTCAGAGAATGACAAAAGATGT  
 CAAGATGAGCCTTGCGGATTTGATGTCACCTCTGCCTACGGCATGGCAGGAGTCGGATGGTCAG  
 GGCTGCCCTTCTGCGTTGAAATAAAGGAACGTAGGCCATAATCGTGGACCCCTTGATCCAAGAG  
 ATGAAGGCTCCAGGTGTTGAGCATTCGACCCCTTGGCATGCCATGCTAGACTGGACGACATGA  
 TGATCGTAGGGAGTCCTTGATGATGAATCGGTTGGCAAACGTCGGAAAGTGCACGTGACAGGCAGACTCA  
 CCAGTCACATCACCAGGATCCTCTCCCCTGGCCAGAGAAAGGCCACAGCCTGACCCACTCCAGATCC  
 CACATCTAACGGCTGCCACCCGTGCCCTCGCGATCTAATTGAGAAAGGCATAGTTAGATCTCCCTG  
 TGGCAGCCCAACAGGTTACAAAAGTCTCTCTGATGGTGGAGAAAACAAGATAAACCACTCCAGCA  
 CCACCTCCCTCTTAAAGAGATCCTCCACCGCACCTGAAAGACCTCCACCAATCCCACCAAGACAATA  
 GACTGAGTAGACACATCCATGTTGAAAGCAGAGAAAGGCCATGCTAGACAGGGAGGGCTCTCCAAA  
 GTGCCCTCGGGATGTGTTGGACTAATCAGCTTGCGGATGTCACCTAGGGAGGGCTCTCCAAA  
 CCTGGAATCACAGCAGTTAACATGTCATGGAAAGGCACAGTAGAGTGGGCTCTGACCCAGTGCTTATGC  
 GGAACACAGACGCCATGATTGCTTAAAGAGCTAAGGTCTTTCAATGGTCACTTGGAGTGA  
 AGAATATGATGTTCTCCCCGGCTTCTCCTCTCCAGTACCTACCCCTCCCTAGCATAAAAGTGT  
 ACTGGTCCGTTAGCAAATTCTCTTCAAGAGAAAACAAGAGACCCAGTAGAGGAAGATGATGAATA  
 AGATTCTTCATCCCACCCCTGTTCCCTGAATTCAACACATCTATTGTCATAATGTA  
 AACACAGGCCATGATAATGGTCACTGATGTTGAAAGCACATGGTCACTTGGAGTGA  
 ATCCCTGACTTAAGCATATAAAAGGGAGATGTTTGATGAGCTCTGCTGATTATGA  
 CTGCCAGGCCCTCAACTCGGGACAATCAGGCTGGTTCTCACTCAACAGGACGCCCTGATTATGA  
 TCTCTCATCCCTCATTAGGTTGAAAACCTTAAAAAAAGTTTGAACAACCCACCCCTCTTAA  
 TTCAGAATTTCAGAATTCAAGAGTTCAGTATAACACAGACTCACTGGGTTGTGAATTGCTGAAATTG  
 AATGGGTTCTCAGGTGCCGTACTCCAAAGTTCACGAGACCAATTACTCCATGAGATGATTAAGGTAG  
 TAGTGTAGTAGTTGGCATCAGTCAGGTTTAAGCAAGTTGTTGCTACTAAATGTA  
 CACATGAGAGCTTGTGCTCTAGTAGTTGAAGTGATGACTGAAGTGTGAGATTTCCTTAAGTATA  
 ATAATTCTTAATAAAATGAACTGCTTTCTGAGCATGAGCACCACTTACGCTAATTAA  
 TATGCAAAATTAAATAGTGTATGTAGAGAACTGATAATAATTCTATTCTAATCATTACA  
 TAACACATTCAAAAAAAAAA

Human CBL-B mRNA sequence - var5 (public gi: 862410) (SEQ ID NO: 357)  
 CTGGGTCTGTGTGCCACAGGGGGGGGGGTGTCAGCGAGGGTCTCTCTCTGCTAGTGTGCTGC  
 GCGCTCCCGCGCCCTCCCCGAGTCGGGGGGAGGGGAGAGCGGGGTGGATTGTCTTGACGGTAATTGT  
 TCGCTTCCACGTCTCGGAGGCCTCGCGCTGGGTGCTCCTCTCGGGAGGAGCTGTTCTAGCGAT  
 CCCACTCCCAGCGGGGCTCCACACACTGGGCTGCCGTGCTGTGGAGTGGACCCCGCGCACACCGCG  
 TGCTCTGGACAGCTACGGCGGGAAAGAACATTCCAGATGGCAAACACTCAATGAAATGGCAGAAACC  
 CTGGGGTCAGGGAGGAATCCCCGAAAGGTCGAATTGGTATTATGATGCTATTGAGATGCACT  
 TGGACCCCTAAGCAAGCTGCCGAGATCGCAGGACCGTGGAGAAGACTTGGAGCTCATGGACAAAGTG  
 GTAAGACTGTGCCAAATCCAAACTCAGTTGAAAATAGCCACCATATAACTTGATATTGCTG  
 ATACATATCAGCATTACGACTTATATTGAGTAAATATGATGACAACCAAGAAACTTGGCCAACCTCAGTGA  
 GAATGAGTACTTAAATCTACATTGATAGCCTTATGAAAAGTCAAAACGGCAATAAGACTCTTAA  
 GAAGGCAAGGAGAGAATGTATGAAAGAACAGTCACAGGACAGCAGAAATCTACAAAACCTGCTCTTATCT  
 TCAGTCACATGCTGGCAGAAATCAAAGCAATTCTCCCAATGGTCAATTCCAGGGAGATAACTTCCTG  
 CACAAAAGCAGATGCTGCTGAATTCTGGAGAAAAGTTTGGAGACAAAACATCGTACCATGGAAAGTA  
 TTCAGACAGTGCCTCATGAGGTCCACCAAGATTAGCTCTAGGCTGGAGCAATGGCTCTAAATCAACAA  
 TTGATTTAACCTGCAATGATTACATTTCAGTTTGATATTGATATTTCAGGCTGTTGAGCTTACATGG  
 GGGCTCTATTGGGAATTGGAATTCTTAGCTGTGACACATCCAGGTTACATGGCATTCTCACATAT  
 GATGAAGTTAAAGCACGACTACAGAAAATAGCAGCAACCCGGAGCTATATTCCGGTTAGTTGCA  
 CTCGATTGGGACAGTGGGCTATTGGTATGTGACTGGGATGGGATATCTACAGACCCATACCTCATAA  
 CAAGCCCTTATTCAAGCCCTGATTGATGGCAGGGAGGATTTATCTTATCCTGATGGGAGGAGT  
 TATAATCCTGATTAACTGGATTATGTGAAACCTACACCTCATGACCATAAAAGTTACACAGGAACAAT  
 ATGAATTATATTGTGAAATGGGCTCCACTTTCAGCTCTGTAAGATTGTCAGAGAAATGACAAAGATGT  
 CAAGATTGAGCCTTGCGGATTTGATGTCACCTCTGCCCTACGGCATGGCAGGAGTCGGATGGTCAG  
 GGCTGCCCTTCTGCGTTGAAATAAAGGAACGTAGGCCATAATCGTGGACCCCTTGATCCAAGAG  
 ATGAAGGCTCCAGGTGTTGAGCATATTGACCCCTTGGCATGCCATGCTAGACTTGGACGACGATGA  
 TGATCGTAGGGAGTCCTGATGATGAATCGGTTGGCAAACGTCGGAAAGTGCACGTGACAGGCAGA  
 CCAGTCACATCACCAGGATCCTCTCCCTGGCCAGAGAAAGGCCACAGCCTGACCCACTCCAGATCC  
 CACATCTAACGGCTGCCACCCGTGCCCTCGCGCTGGATCTAATTGAGAAAGGCATAGTTAGATCTCC  
 TGGCAGCCCAACAGGTTACCAAAGTCTCTCCCTGAGGGAGAAAACAAGATAAAACCACTCCAGCA  
 CCACCTCTCCCTTAAGAGATCCTCCACCGCCACCTGAAAGACCTCCACCAATCCACCAAGACAATA  
 GACTGAGTAGACACATCCATGTTGGAAAGCAGTCGCTCTCCAGAGACCCGCCATGCTCTGAA  
 GTGCCCTCGGGATGTGTTGGACTAATCAGCTGTGGGATGTCACCTCTAGGGAGGGCTCTCCAAA  
 CCTGGAATCACAGCAGTTCAATGAAAGGCACAGTAGAGTGGGCTCTGACCCAGTGCTTATGC

Figure 36 part - 15

GGAAACACAGACGCCATGTTGCCCTTAGAAGGAGCTAAGGTCTTCCAATGGTCACCTGGAAAGTGA  
AGAATATGATGTTCCCTCCCCGGCTTCTCCTCCCTCCAGTACCAACCCCTCCCTCCAGTACATAAAGTGT  
ACTGGTCCGTTAGCAAATTCTCTTCAAGAGAAAACAAGAGACCCAGTAGAGGAAGATGATGAATACA  
AGATCCCTCATCCCACCCCTGTTCCCTGAATTACAACCATCTCATTGTCATAATGTAACACCTCCCTGT  
TCGGCCTGTGATAATGGTCACTGTATGCTGAATGGAACACATGGTCCATCTTCAGAGAAGAAATCAAAC  
ATCCCTGACTTAAGCATATAATTAAAGGGTAGTATAGAATATAATTTCCTTGTGATGTACATCTTAAAT  
GGTACAATTAAAGGCAAATTTCATGCCATTGACTGAAAATACATTAAGGTTTGTTATCCTCTA  
GGAGATGTTTTGATTGAGTCAGCGCTCTGATCCCGTGCATTACACCTGCCAGGCTCCAACCGGACAATC  
CAAAGCATGGTCTTCACTCAACAGGACGCCCTGTGATTATGATCTTCACTCCCTCATTAGGGTAAA  
CCTTAAAAAGTTGAAACAACCCACCCCTCTTAAATTTCAGAATTTCAGAATTTCAGAATTTCAGAGTTCA  
GTATAACACAGACTCACTGGGTTGTGAATTGCTGAAATTGAAATGGGTCTCCAGGTGCCGGTGACTC  
CCAAGTTACCGAGACCATTACTCCATGTAGATGATGTTAGGTAGTAGTGAGTTGGGCATCAGTCAGG  
TTTAAAGCAAGTGTGTTGTCATACTAAATGTTAGTCTAAACATGAGAGCTTGTGCTCTAGTAGT  
TTTGAAGTGTGACTTGAAGTGTGAGATTCTTAAGTATAAAATTCTTAAATAATGAACTTGCT  
TTCTTGAGCATGAGCACAGTCCACTACGCTAATTAAATTATGAAATTAAATAGTTGTATGTAG  
AGAACTGATAATAATTCTGTTTATTCTAATCATTACAACATTGTAACACATTCAAAAAAAAAAA

Human CBL-B mRNA sequence - var6 (public gi: 21753192) (SEQ ID NO: 358)  
AGTGCCTGCTGGCGTCCCGCGGCTCCCGAGTCGGGCGGGAGGGAGAGCGGGGTGTTGATTTGCTTG  
ACGGTAATTGTTGCGTTCCACGTCTCGGAGGCGTGGCGCTGGGTTGCTCCTCTCGGGAGCGAGCTG  
TTCTCAGCGATCCCACCTCCAGGCCGGGCTCCACACACTGGGCTGCGTGTGGAGTGGGACCC  
GCCACACCGCGTCTCTGGACAGCTACGGCGCCAAAGAAGTAAATTCCAGATGCCAAACTCAATGAA  
TGGCAGAAACCCCTGGTGTGAGGGAGGAAATTCCCGAAAGGTCGAATTGGGTTATTGATGCTATT  
CAGGATGAGCTGGGCCCCCTAAGCAAGCTGCCGAGATCGAAACCTGGAATCACAGCAGTCAAAT  
GTCAATGGAAGGCACAGTAGAGTGGGCTGACCCAGTGTATGCGGAAACACAGACGCCATGATTG  
CTTAAAGGAGCTAAGGTCTTCCAATGGTACCTTGGAGTGAAGAATATGATGTTCTCCCGGCT  
TTCCTCTCTCCAGTTACCAACCCCTCCCTAGCATAAAGTGTACTGGTCCGTTAGCAAATTCTCTT  
TCAGAGAAAACAAGAGACCCAGTAGAGGAAGATGATGATGAAATACAAGATTCTCATCCACCCCTGTT  
CCCTGAATTCAACCATCTCATTGTCATAATGTAACACCTCCCTGTTGTGATAATGGTCACTG  
TATGCTGAATGGAACACATGGTCCATCTCAGAGAAGAAATCAAACATCCCTGACTTAAGCATAATTAA  
AAGGGAGATGTTTGATTGAGCTGGCTCTGATCCCGTGCCTTACCCACTGCCAGGCCCTCAACTCGGGACA  
ATCCAAGCATGGTCTTCACTCAACAGGACGCCCTGTGATTAGTCTCATCCCTCCATTAGGTGA  
AGATGTTTGATGCCCTCCCATCTCCCACCTCCCTGCGTCCAGGATCTTCTTCCCTCAGATC  
CATTCAAAACCTCTGGCTCCAGTAGCCGGCATCTCAGGACAGGATCTTCTTCCCTCAGATC  
CCTTGTGATCTAGCAAGTGGCAAGTTCTTGCCTCTGCTAGAAGGTTACCAAGGTGAAATGTCAA  
AACTAACAGAACATCACAGGACTATGATCAGCTTCTTCTGATGTTCAAGATGGTTCACAGGCATGCCAGA  
CCCCCTAAACCAACGACCGCGCAGGACTGCACCAGAAATTCAACCACAGAAAACCCATGGGCTGAGGCGG  
CATGGAAAATGTCGATGCAAAATTGCAAAACTCATGGGAGAGGGTTATGCCCTTGAAGAGGTGAAGAG  
AGCCTTAGAGATAGCCCAGAAATAATGCGAAGTTGCCGGAGCATCCTCCGAGAATTGCCCTCCCT  
CCAGTATCCCCACGTCTAAATCTATAGCAGCCAGAACTGTAGACACCAAATGGAAAGCAATGATGTAT  
TCCAAGAGTGTGAAATAAGAGAACTGAGATGGAATTCAAGAGAGAAGTGTCTCCCTCGTGTAGCAG  
CTTGAGAAGAGGCTTGGGAGTGCAGCTCTCAAGGAGACCGATGCTGCTCAGGATGTCGACAGCTGTG  
GCTTCTTGTGTTTGCTAGCCATATTAAATCAGGGTTGAACTGTGACAAAAATAATTAAAGACGTTA  
CTTCCCTGAACTTGAACCTGTGAAATGCTTACCTTGTGTTACAGTTGGCAAGGTTGAGTTGTTCT  
TGTTTTAGTTAGTTGGTTGGTGTGACTGTGACTGTTCTCACAGACCCCTTGTAGCGTG  
GTCAGGTCTGCTGTAACATTCCACCAACTCTTGTGTCACATCAACAGCTAAATCATTATTCT  
ATGGATCTTACCATCCCCATGCCCTGCCAGGTTCAATTCTCATTCAAGATGCTTGAA  
GGTCTGATTCAACTGATCAAACATGCAAAAAAAAAAAAAAAAG

Human Cbl-b mRNA sequence - var 7 (SEQ ID NO: 359)  
CGTTTGGNANNCACTACAGGGATGTTAATACACACTCACATGCGCATGATGNTATAACTATCTATTNATGAT  
G  
TAAGATACCCACTCAAACCCATAAAAAGAGCATCTTAAATACGACTCACTATANGCGAGCGACGCCATGGCAGGT  
A  
CCCATAACGACGTACCAAGATTACGCTCATGGCATGGAGGCCAGNGAATTCCACCAAGCNGTGGTATCAACGCAAG  
T  
GGACTCTGACCCANTGCTTATGCGGAAACACAGACGCCATGATTGCTTACAAGGAGCTAAGGTCTCTTCAATGGT  
C  
ACCTTGGAAAGTGAAGAATATGATGTTCTCCCCGGTTCTCCTCCCTCCAGTTACCAACCCNTCTCCAGTAA  
G  
TGTACTGGTCCGTTAGCAAATTCTCTTCAAGAGAAAACAAGAGACCCAGTAGAGGAAGATGATGAATACAAGATT  
C

PCT/US04/06308

TTCATCCCACCCCTGTTCCCTGAATTACAACCATCTCATTGTCTATAATGTAACCTCCTGTTGGTCTTGATAAT  
G  
GTCACTGTATGCTGAATGGAACACATGGTCCATCTCAGAGAAGAAATCAAACATCCCTGACTTAAGCATATATTTAAA  
G  
GGTGAAGATGCTTTGATGCCCTCCCTCCATCTCTCCCACCTCCCCACCTCCTGCAAGGCATAGTCTCATTGAACATT  
C  
AAAACCTCCTGGCTCCAGTAGCCGGCATCCTCAGGACAGGATCTTCTTCTCAGATCCCTTGTGATCTA  
G  
CAAGTGGCCAAGTCCTTGCTCCAGTAGAAGGTTACCAAGGTGAAACTAACAGGACATCACAGGACTA  
T  
GATCAGCTTCCTCATGTTAGATGGTCACAGGCACCAGCAGACCCCTAAACCACGACCGCAGGACTGCACCAG  
A  
AATTCAACCACAGAAAACCCATGGGCTGAGGCGCATTGGAAAATGTCATGCAAAACTCATGGGAGAG  
G  
GTTATGCCTTGAGAGGTGAAGAGAGCCTTAGAGATAGCCCAGAATAATGTCAGTIGCCGGAGCATCCTCCGAGA  
A  
TTTGCCTCCCTCCAGTATCCCCACGTCTAAATCTATAGCAGCCAGAACTGTAGACACCAAAATGGAAAGCAATCG  
A  
TGTATTCCAAGAGTGTGAAATAAGAGAACTGAGATGGAATTCAAGAGAGAAAGTGTCTCCTCTCGTAGCAGCTTG  
A  
GAAGAGGCTTGGAGTGCAGCTCTCAAAGAAAACCGATGCTGCTCAGGATGTCNACAGCTGGNCTNCCTGTTT  
T  
GCTAGCCATTTTAAATNAGGGTGAACNTNGANAAAANTTTAAAAACGTTACCTCCCTGAACCTTGAACCTGG  
G  
AAAGNC

Human Cbl-b Protein sequence - var 7 (SEQ ID NO: 361)  
MRKRRHDLPLEGAKVSSNGHLGSEEVDPVPRLSPPPVTLLPSIKCTGPLANSLSKTRDPVEEDDDEYKIPSSH  
S  
LNSQPSHCHNVKPPVRSCDNHGMLNGTHGPSSEKKSNIPLDSIYLKGEDAFLPDSLPPPPPARHSLIEHSKPPGS  
S  
SRPSSGQDLFLLPSPDFVDLASGQVPLPPARRLPGENVKTNRTSQDYDQLPSCSDGSQAPARPKPRRRTAPEIHHRK  
P  
HGPEAALENVDAKIAKLMGEYAFEEVKRALEIAQNNVEVARSLREFAFPPPVSPRLNL

Human cbl-B clone3Gd114 (partial sequence) (SEQ ID NO: 360)  
ACTCTGACCCAGTCTTATGCGGAAACACAGACGCCATGATTTGCCCTTA  
GAAGGAGCTAAGGTCTCTCCAATGGTCACCTTGGAAAGTGAAGAATATGA  
TGTCCCTCCCCGGCTTCTCCTCCTCCAGTTACCAACCTCCCTCTA  
GCATAAAAGTGTACTGGTCCGTTAGCAAATTCTCTTCAGAGAAAACAAGA  
GACCCAGTAGAGGAAGATGATGATGAATACAAGATTCTCATCCCACCC  
TGTTCCTGAAATTACAACCATCTCATTGTCTATAATGTAACACTCCCTG  
TTCGGTCTTGATAATGGTCACTGTATGTAATGGAAACACATGGTCCA  
TCTCAGAGAGAAAATCAAACATCCCTGACTTAAGCATATATTTAAAGGG  
TGAAGATGCTTTGATGCCCTCCCTCATCTCTCCACCTCCCCACCTC  
CTGCAAGGCATAGTCTCATGAAACATTCAAACCTCTGGCTCCAGTAGC  
CGGCCATCCTCAGGACAGGATCTTCTTCTCCTCAGATCCCTTGT  
TGATCTAGCAAGTGGCCAAGTCTTGCCTCCGCTAGAAGGTACCA  
GTGAAAATGTCAAAACACAGGACATCACAGGACTATGATCAGCTTCCT  
TCATGTTAGATGGTTACAGGCACCAGCAGACCCCTAAACCCACGACC  
GCGCAGGACTGCACCAGAAATTCAACCACAGAGAAAACCCATGGGCTGAGG  
CGGCATTGGAAAATGTCAGTGCAAAATGCAAAACTCATGGGAGAGGGT  
TATGCCTTGAGAGGGTGAAGAGAGCCTTAGAGATAGCCAGAATAATGT  
CGAAGTTGCCGGAGCATCCTCCGAGAATTGCTTCCCTCCTCAGTAT  
CCCCACGTCTAAATCTATAGCAGCCAGAACTGTAGACACCAAAATGGAAA  
GCAATCGATGTATTCCAAGAGGTGAGAATAAGAGAACTGAGATGGAAT  
TCAAGAGAGAAGTGTCTCCTCCCTGAGCTGAGCAGCTGAGAAGAGGCTTGG  
GAGTCAGCTCTCAAAGAAAACCGATGCTGCTCAGGATGTCAGCAGCT  
GTGGCTTCCCTGTTGCTAGCATTAAATCAGGGTTGAACCTGGAAA  
AAAAAAATTATTTAAAACGTTACCTCCCTGAACCTTGAACCTGGAAA

Figure 36 part - 17

GGC

Human CblB protein in 3Gd114 Translation of cbl-B clone 3Gd114 starting at base pair 3 (SEQ ID NO: 398)

SDPVLMRKHRRHDLPLEGAKVSSNGHLGSEEEYDVPPLSPPPPVTLLPS  
TKCTGPLANSI~~SEKTRDPVEEDDDEYKIPSSH~~VSLNSQPSHCHNVKPPV  
RSCDNGHCMILINGTHGPSSSEKKSNIPDLSIYLKGEDAFDALPPSLPPPPP  
ARHSLIEHSKPPGSSSRPSSGQDLFLLPSDFVDSLASGQVPLPPARRLP  
ENVKTNRTSQDYDQLPSCSDGSQAPARPKPRRTAPEIHHRKPHGPEA

Human CBL-B Protein sequence - var1 (public gi: 4757920) (SEQ ID NO: 227)

MANSMNGRNPGGRGGNPRKGRILGIIDAIQDAVGPPKQAAADRRTVEKTWKLMDKVVRCLCQNPKLQLKNS  
PPYILDILPDTYQHLRLILSKYDDNQKLAQLSENEYFKIYIDSLMKKSRAIRLFKEGKERMYEEQSQDR  
RNLTCLSIFSHMLAEIKAI~~F~~PNGQFQGDNFRTKADAAE~~FW~~RKFFGDKTIVPWKFVFRQCLHEVHQISSS  
LEAMALKSTIDLTCDYISVFEDIFTRLFQPWGSI~~LR~~NWNFLAVTHPGYMAFLTYDEVKARLQKYSTKP  
GSYI~~F~~R~~L~~SCTRLGQWAIGYVTGDN~~G~~NI~~L~~Q~~T~~I~~H~~NKPLFQALIDGSREGFYL~~Y~~PDGRSYNPDLTGLCEPTPH  
DH~~I~~KV~~T~~QE~~Q~~E~~Y~~LYCEMG~~S~~TFQ~~L~~C~~K~~ICAENDKDVKIEPCGHLMCTS~~L~~TAWQESDGQGCPFCRCEIKGTEP  
IIVDPFDPRDEGS~~RCCS~~I~~D~~PFGMPM~~L~~D~~L~~DDDDREESLMMNRLANVRKCTDRQNSPVTSPGSSPLAQRR  
K~~P~~Q~~P~~D~~L~~Q~~I~~PH~~L~~SLPPV~~P~~RL~~D~~LIQ~~K~~GIV~~R~~SPCGS~~T~~GSPK~~S~~PCMVRKQDK~~K~~PLPAPPPLRD~~PP~~PPPE  
R~~P~~P~~I~~PPDNRLSRHHV~~E~~VPSRDPMPLEAWC~~P~~RDVFTNQLVGCR~~L~~GE~~G~~SP~~K~~PGITASSNVNGRHS  
RVGSDPVLMRKHRRHDLPLEGAKVFSNGHLGSEEEYDVPPLSPPPPVTLLPSI~~K~~CTGPLANSI~~SE~~KTRD  
PVEEDDDEYKIPSSH~~V~~SLNSQPSHCHNVKPPVRSCDNGHCMILINGTHGPSSSEKKSNIPDLSIYLKGDVFD  
SASDPVPLPPARPPTRDNPKHGSSLNRTPSDYD~~L~~LI~~P~~LGEDAFDALPPSL~~PP~~PPPARHSLIEHSKPPG  
SSSRPSSGQDLFLLPSDFVDSLASGQVPLPPARRLPGENVKTNRTSQDYDQLPSCSDGSQAPARPKPRP  
RRTAPEIHHRKPHGPEAALENVD~~A~~KIAKLMGE~~Y~~AFEEVKRALEIAQNNVE~~V~~ARSILREFAFPPPVSPRL  
NL

Human CBL-B Protein sequence - var2 (public gi: 23273909) (SEQ ID NO: 228)

MANSMNGRNPGGRGGNPRKGRILGIIDAIQDAVGPPKQAAADRRTVEKTWKLMDKVVRCLCQNPKLQLKNS  
PPYILDILPDTYQHLRLILSKYDDNQKLAQLSENEYFKIYIDSLMKKSRAIRLFKEGKERMYEEQSQDR  
RNLTCLSIFSHMLAEIKAI~~F~~PNGQFQGDNFRTKADAAE~~FW~~RKFFGDKTIVPWKFVFRQCLHEVHQISSG  
LEAMALKSTIDLTCDYISVFEDIFTRLFQPWGSI~~LR~~NWNFLAVTHPGYMAFLTYDEVKARLQKYSTKP  
GSYI~~F~~R~~L~~SCTRLGQWAIGYVTGDN~~G~~NI~~L~~Q~~T~~I~~H~~NKPLFQALIDGSREGFYL~~Y~~PDGRSYNPDLTGLCEPTPH  
DH~~I~~KV~~T~~QE~~Q~~E~~Y~~LYCEMG~~S~~TFQ~~L~~C~~K~~ICAENDKDVKIEPCGHLMCTS~~L~~TAWQESDGQGCPFCRCEIKGTEP  
IIVDPFDPRDEGS~~RCCS~~I~~D~~PFGMPM~~L~~D~~L~~DDDDREESLMMNRLANVRKCTDRQNSPVTSPGSSPLAQRR  
K~~P~~Q~~P~~D~~L~~Q~~I~~PH~~L~~SLPPV~~P~~RL~~D~~LIQ~~K~~GIV~~R~~SPCGS~~T~~GSPK~~S~~PCMVRKQDK~~K~~PLPAPPPLRD~~PP~~PPPE  
R~~P~~P~~I~~PPDNRLSRHHV~~E~~VPSRDPMPLEAWC~~P~~RDVFTNQLVGCR~~L~~GE~~G~~SP~~K~~PGITASSNVNGRHS  
RVGSDPVLMRKHRRHDLPLEGAKVFSNGHLGSEEEYDVPPLSPPPPVTLLPSI~~K~~CTGPLANSI~~SE~~KTRD  
PVEEDDDEYKIPSSH~~V~~SLNSQPSHCHNVKPPVRSCDNGHCMILINGTHGPSSSEKKSNIPDLSIYLKGDVFD  
SASDPVPLPPARPPTRDNPKHGSSLNRTPSDYD~~L~~LI~~P~~LGEDAFDALPPSL~~PP~~PPPARHSLIEHSKPPG  
SSSRPSSGQDLFLLPSDFVDSLASGQVPLPPARRLPGENVKTNRTSQDYDQLPSCSDGSQAPARPKPRP  
RRTAPEIHHRKPHGPEAALENVD~~A~~KIAKLMGE~~Y~~AFEEVKRALEIAQNNVE~~V~~ARSILREFAFPPPVSPRL  
NL

Human CBL-B Protein sequence - var3 (public gi: 862407) (SEQ ID NO: 229)

MANSMNGRNPGGRGGNPRKGRILGIIDAIQDAVGPPKQAAADRRTVEKTWKLMDKVVRCLCQNPKLQLKNS  
PPYILDILPDTYQHLRLILSKYDDNQKLAQLSENEYFKIYIDSLMKKSRAIRLFKEGKERMYEEQSQDR  
RNLTCLSIFSHMLAEIKAI~~F~~PNGQFQGDNFRTKADAAE~~FW~~RKFFGDKTIVPWKFVFRQCLHEVHQISSS  
LEAMALKSTIDLTCDYISVFEDIFTRLFQPWGSI~~LR~~NWNFLAVTHPGYMAFLTYDEVKARLQKYSTKP  
GSYI~~F~~R~~L~~SCTRLGQWAIGYVTGDN~~G~~NI~~L~~Q~~T~~I~~H~~NKPLFQALIDGSREGFYL~~Y~~PDGRSYNPDLTGLCEPTPH  
DH~~I~~KV~~T~~QE~~Q~~E~~Y~~LYCEMG~~S~~TFQ~~L~~C~~K~~ICAENDKDVKIEPCGHLMCTS~~L~~TAWQESDGQGCPFCRCEIKGTEP  
IIVDPFDPRDEGS~~RCCS~~I~~D~~PFGMPM~~L~~D~~L~~DDDDREESLMMNRLANVRKCTDRQNSPVTSPGSSPLAQRR  
K~~P~~Q~~P~~D~~L~~Q~~I~~PH~~L~~SLPPV~~P~~RL~~D~~LIQ~~K~~GIV~~R~~SPCGS~~T~~GSPK~~S~~PCMVRKQDK~~K~~PLPAPPPLRD~~PP~~PPPE  
R~~P~~P~~I~~PPDNRLSRHHV~~E~~VPSRDPMPLEAWC~~P~~RDVFTNQLVGCR~~L~~GE~~G~~SP~~K~~PGITASSNVNGRHS  
RVGSDPVLMRKHRRHDLPLEGAKVFSNGHLGSEEEYDVPPLSPPPPVTLLPSI~~K~~CTGPLANSI~~SE~~KTRD  
PVEEDDDEYKIPSSH~~V~~SLNSQPSHCHNVKPPVRSCDNGHCMILINGTHGPSSSEKKSNIPDLSIYLKGDVFD  
SASDPVPLPPARPPTRDNPKHGSSLNRTPSDYD~~L~~LI~~P~~LGEDAFDALPPSL~~PP~~PPPARHSLIEHSKPPG  
SSSRPSSGQDLFLLPSDFVDSLASGQVPLPPARRLPGENVKTNRTSQDYDQLPSCSDGSQAPARPKPRP  
RRTAPEIHHRKPHGPEAALENVD~~A~~KIAKLMGE~~Y~~AFEEVKRALEIAQNNVE~~V~~ARSILREFAFPPPVSPRL  
NL

Human CBL-B Protein sequence - var4 (public gi: 862409) (SEQ ID NO: 230)

MANSMNGRNPGGRGGNPRKGRILGIIDAIQDAVGPPKQAAADRRTVEKTWKLMDKVVRCLCQNPKLQLKNS  
PPYILDILPDTYQHLRLILSKYDDNQKLAQLSENEYFKIYIDSLMKKSRAIRLFKEGKERMYEEQSQDR

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RNLTKLSLIFSHMLAEIKAFPNGQFQGDNFRITKADAAEFWRKFFGDKTIVPKVFRQCLHEVHQISSS  
LEAMALKSTIDILTCNDYISVFEFDIFTRLFPWGSILRNWNFLAVTHPGYMAFLTYDEVKARLQKYSTKP  
GSYIFRLSCTRLGQWAIGVTGDGNILQTIPHNKPLFQALIDGSREGFYLYPDGRSYNPDLTGLCEPTPH  
DHIKVTQEYELYCEMGSTFQLCKICAENDKDVKIEPCGHLMCTSCLTAQESDGQGCPFCRCEIKGTEP  
IIVDPFDPRDEGSRCCSIIDPFGMPMLDDDDREESLMMNRLANVRKCTDRQNSPVTPGSSPLAQRR  
KQPQDPLQIPHLSLPPVPRLDLIQKGIVRSPCGSPTPKSSPCMRKQDKPLPAPPPLRDPPPPPPE  
RPPPPIPDPNRSLRHIIHVESVPSRDPMPLAECPRDVFGTNQLVGCRLLGEGSPKPGITASSNVNGRHS  
RVGSDPVLMRKRRHDLPLEGAKVFSNMGHLSSEYDVPVPLSPPPVTLLPSIKCTGPLANSLEKTRD  
PVEEDDDEYKIPSSHVPVSLSNQPSHCHNVKPPVRSCDNGHCMLNTHGPSSSEKKSNIPLSILYLGVD  
SASDPVPLPPARPPTRDNPKHGSSLNRTPSDYDLIPLPLG

Unigene Name: CENTB1 Unigene ID: Hs.337242

Human CENTB1 mRNA sequence - var1 (public gi: 495679) (SEQ ID NO: 37)  
GGGGTGAGAGCTCCTCTAGGACACCCCTTTCCCCCTGGGAAAGAATTGTGCCCTCAGGCCCTCCCCG  
CGGAGGTCCCTCCTCCCTCCCCCATCTCCCTGGGACAGAAAGTGCCTCACCTGCATCCCC  
AGGGGCCGGCTCCAGGGCCCTGGCCCCACAGCAGGCAAGCTGAGATGACGGTCAAGCTGGATTTCG  
AGGAGTGTCTCAAGGACTCACCCCGTTCCAGGCTCTATTCGAGCTGGATGGCTGGGAAGGCGAAGTGTCAAATT  
GGAGACCCGCTGGAAAAGCTCTGAAACTGGGCACTGGTCTCTGGAAAGTGGCGCCATTACCTTGCT  
GCCAGCCGCGCTTCGTTCTGGCATTGTGAGCTGGAAAGTGGCGCCATTACCTTGCT  
AGTGTCTGGAAAATTACCGTGAACCACAAGCTGGACAGCCATGGAGCTCTAGATGCCAC  
CCAACACACACTGCAGCAGACCCCTGGTCAAGGAAGGTCTGGGGGTTCCGAGAGGCTCG  
CGGGATTCTGGGGGGCTGAGGGCTGGAGGCTGCCCTGACCCACAACGAGAGGTTCCCAGGC  
GGGGCCAGGAGGCAGAAGAGGCAGGAGCTGTTGAGGACGGCTCGAGCTGGGTACCGGGGACGGGACT  
GGATTATGCCCTGAGATCAACGTATTGAGGACAAGAGGAAGTTGACATCATGGAGTTGTGCTGCGT  
TTGGTGGAGGCCAGGCTACCCATTCCAGCAGGCCATGAGGAGCTGAGCCGGCTGCCCAGTATGAA  
AGGAGCTGGGCCAGTTGACCGAGCTGGTCTGAATTACGACAGGAGAACATGGAGCAGAG  
ACACGTGCTGCTGAAACAGAAGGAGCTGGTGGGGAGGAGCCAGAACCAAGCTTAAGAGAGGGGCTGGT  
GGCTCTGGTGTGGAGGACATCTCTCAAACGGGGCAGCAACGCATTAAAGACCTGGACTGTTGGATGA  
TCACCATTCAAGAGCAACCAACTGGTTTACCAAGAAGAAGTACAAGGACCTGTGACTCTGGTGGATGA  
CCITCGTCTCTGCAAGTGAACACTCTGGCTGACTCAGAAAGGGCTTCTGCTTGGAGGTGGTGTCCACC  
AGCAAGTCTGGCTCTCCTCAGGCTGACTCAGAGCCCTCTGACAGCTGGGTCAAGTGTGTGAGAGCA  
GCATTGCTTCTGCTTCAAGTCAACAGATCTATGAGGCCGCTGGAGGACAGGCTCAGGACA  
CCTGGCCATAGGCTCTGCTGCCACCCGGCTGGTGGAAATGCCAGGGGAAGGGAGCCTGGGGAGTC  
GGCACGTTGGGCCAGGCTCAGAGTGTGGATGCCATGCCAGTGCTGCACTGCCGGAGCCAGCCC  
CGGAGTGGGCCAGCATCAACCTGGTGCACCCCTGCATTAGTGTCCGGCATCCACAGGAGCCTGG  
TGTTCACTTCTCAAAGTCCGGTCTCTGACCCCTGACTCATGGAGGCCAGAAACTAGTGAAGCTCATGTG  
GAGCTGGAAATGTCACTCAACCAGATCTATGAGGCCGCTGGAGTCAAGCTAAATACGTGGAGAAGAAGTCCCTGAC  
GGCCCAGCTCTCCGGCAGGAGAAGGAGGCTGGATTCAAGCTAAATACGTGGAGAAGAAGTCCCTGAC  
CAAGCTGCTGAGATTGAGGGGAAGAGGTGGCCGGGGGCCAAGGGGGCAGGCCCTGTGCCCCCA  
AAGCTTCCATCAGGCCCGGCCAGGGAGCTTGAGATCCAAGCCAGGCCCTCTGAGGACCTGGAA  
GCCCTGCACCCCTGGGGCCCTACTTTGAGCTGGCATCCTCCATCTCTCCACCATGGCTGATGC  
CCTTGCCCATGGAGCTGATGTCATACTGGTCAATGGGCAAGATAATGCCACCCGCTGATCCAGGCC  
ACAGCTGCTAAATTCTCTGGCTGTGAGTTCTCTCCAGAACGGGGCAACGTGAACCAAGGGGACA  
GTGCGGGCCGGGGCCCTGCAACCGAACCATCTGGCACACGGGGCTGCCCTGTTCTGAA  
ACGGGGAGCTGATCTGGGGCTGAGACTCTGAAGGGCAGGGACCTCTGACCATGCCATGGAAACAGCC  
AACGCTGACATCGTACCCGCTACGACTGGCAAAGATGAGGGAGGCTGAAGCGGCCAGGGCAGGCC  
GAGATGAGACGTATCTTGACATCTCCCGCACTTCTCCCTCATGGCTCAGACGACCCGGAGAAGCTGAG  
CCGTCGAGTCATGACCTCCACACGCTGTGACCCGAGGCCACGGGCCCTGCCCTCCCTCCCCG  
CCACCGGGCCCTCTGCCATTAAAGCTCCGTCTCGCTTCC

Human CENTB1 mRNA sequence - var2 (public gi: 17391288) (SEQ ID NO: 38)  
GAGCTCCTCTAGGACACCCCTTCCCCCTGGGAAAGGATTGTGCCCTCAGGCCCTCCCCGGAGGT  
CCCTCTCCTCTCCCCCTCATCTCCCTCTGGGACAGAAAGTGCCTCACCTGCATCCCCAGGGGCC  
CGGCCTCCAGGGCCGCTGGCCCCACAGCAGGCAAGCTGAGATGACGGTCAAGCTGGATTTCGAGGAGTG  
TCTCAAGGACTCACCCCGTTCCGAGGCTCTATTGAGCTGGTGGAAAGCCGAAGTGTCAAGAATTGGAGACC  
CGCTCTGGAAAAGCTCTGAAACTGGGACTGGTCTCTGGAAAGTGGGCCCATACCTTGCTGCCAGCC  
GCCCTCTGGTGTGGCATTGTGACCTGGGCCCTGGGCCACAGAGGCCATGATGGGGAGGTCT  
GGAAAAATTACCGTGAGGCTGAACCAAGCTGGACAGCCATGCCAGGGCTTAGATGCCACCCACAC  
ACACTGCAGCAGCAGATCCAGACCCCTGGTCAAGGAAGGTCTGGGGGTTCCGAGAGGCTGCCGGGATT  
TCTGGGGGGCTGAGAGCCTGGAGGCTGCCCTGACCCACAACGCCAGAGGTTCCAGGCCGGGCACTGGATTAT  
GGAGGAGAAGAGGCCAGGAGCTGCTTGTGAGGACGGCTGAGCTGGGTACGGGGACTGGATTAT

Figure 36 part - 19

GCCCCCTGCAGATCACGTATTGAGGAACAAGAGGAAGTTGACATCATGGAGTTGTGCTGCCGTTGGTGG  
 AGGGCCAGGTACCCATTTCCAGCAGGGCATGAGGAGCTGAGCCGCTGCCAGTATCGAAAGGAGCT  
 GGGCCGCCAGTGTGACCAGCTGGTCTTGAATTCAAGCAGAGAGAAGAGGGACATGGAGCAGAGAACACGTG  
 CTGCTGAAACAGAAGGAGCTGGTGGGGAGGAGCCAGAACCAAGCTTAAGAGAGGGGCTGGTGGCCTGG  
 TGATGGAAGGACATCTCTTAAACGGCCAGCAACGCATTTAACGACTGGAGCAGACGCTGGTTCACCAT  
 TCAGAGCAACCAACTGGTTACCAAGAAGTACAAGGACCCGTGACTGTGGTGGTGGATGACCTTCGT  
 CTCTGCACAGTGAAACTCTGCCCTGACTCAGAAAGGCGGTTCTGCTTGTGGAGGTGGTGTCCACAGCAAGT  
 CCTGCCTCCTCCAGGCTGACTCAGAGCGCCTCCTGCAGCTGTGGGTCACTGTGAGCAGCAGCATTGC  
 TTCTGCCTTCAGTCAGGCTCGCCTTGATGACAGCCCCGGGGTCCAGGCCAGGGCTCAGGACACTGGCC  
 ATAGGCTCTGCCACCCCTGGGCTCTGGGAATGGCCAGGGAGGGAGGAGCCCTGGGGAGTCGGGCACG  
 TGGTGGCCAGGTCAGAGTGTGATGGCAATGCCAGTGTGACTGCCAGTGGTGTGGTGTTCAC  
 GCCAGCATCAACCTGGTGTCAACCTCTGCATTCACTGTGGGAGCAGAAACTAGTGAAGCTCATGTGTGAGCTGG  
 TTCTCCAAAGTCCGGTCTGTGACCCCTGACTCATGGGAGCAGAAACTAGTGAAGCTCATGTGTGAGCTGG  
 GAAATGTATCATCAACCAAGATCATGAGGCCCGCTGGAGGCCATGGCAGTGAAGAAACCAGGGCCAG  
 CTGCTCCCGCAGGAGAACGGAGGCCATTACGCTAAATACGTGGAGAAGAAGTTCCTGACCAAGCTG  
 CCTGAGATTGAGGGCGAACAGGGTGGCGGGGGCGCCAAGGGGAGCCTCTGTGCCCCCAAAGCCTT  
 CCATCAGGCCCCGGCCAGGGAGCTTGAGATCCAAGCCAGAGCCCCCTCTGAGGACCTGGGAGCCTGCA  
 CCCTGGGGCCCTACTGTTCAGCGCTGGCATCTCCATCTTCCCACCATGGCTGATGCCCTTGCC  
 CATGGAGCTGATGTCAACTGGGCAATGGGGCAAGATAATGCCACACCGCTGATCCAGGCCACAGCTG  
 CTAATTCTCTCTGGCTGTGAGTTCTCTCCAGAACGGGCGAACGTGAACCAAGCGGACAGTGCAGGG  
 CCGGGGCCCCGCTGCACCGCAACCTCTGGGACACGGGCTCGCTGAGCATGCCATGGAAACAGCCAACGCTG  
 GCTGATCTGGGGCTCGAGACTCTGAAGGCAGGGACCCCTCTGACCATGCCATGGAAACAGCCAACGCTG  
 ACATCGTACCCCTGCTACAGACTGGCAAGATGAGGGAGGCTGAAGCGGCCAGGGCAGGCAGGAGATGA  
 GACGTATCTGACATCTCCGCACTCTCCATGGCGTACAGCAGCCAGGGCCACGGGGCCGCGCTGCCCTCCCG  
 AGTCAATGACCTCCACACGCTGTGACCCGAGGGCCACGGGGCCGCGCTGCCCTCCCG  
 GCCCTCTGCCATTAAAGCCTCCGTCTCGCTCAAAAAAAAAAAAAA

Human CENTB1 mRNA sequence - var3 (public gi: 34533014) (SEQ ID NO: 39)

ATGTCAGCGTGGCTGTTCCATGGGATGGTCAGAGGGTCCCTGCCCTCAGAGTCTCGAGCCCCCAGAT  
 CAGCTCCCGTTCAAGAACAGGCAGGCAGCCCTGGAGAGAACAGGCCAGGGTCAAGCCGGCCGCCAACTT  
 CTOCCAGCCTTCCCTCCCATGCCATCATCCCTACCCCGTGTGGCAAGAATGGTTGCGTGGTGCAGCGGG  
 CCCGGCCCCGACTGTCCGCTTGGTCACGTTGCCCGTCTGGAGGAGAAACTCACAGGCCAGAACAG  
 AATTCTGCATGGAGAACGTCAGAGAACGGGGGGTTGAGGGTGGCATCCCTAGTGGTGGATTCAAGATGTCTT  
 AGGGTGGCGCAGTTCAAGAACGGGGTGGAGTGTGGTAATCAGGAGTGTGGAGGGGTTACAGCTA  
 ACTGTAACCAAGCTAGGCTTGGCTCAAGCTTGCATGTATTCAATATAAAATCCATAGTACAAGCTTT  
 TGAGGTATGTACTATTTACAGATGAGGCTGAGAGGTTAAATACCTGTTAAAAGTCTCTGTAGGCCGG  
 GCACAGTGGCTCACGCCAGTAATCCCAAGCACTTGGGAGGGCGAGGGGGTGGATCACAGGTCAGGAGA  
 TCCAGACCATCTGGTAGCACGGTGGAGGCCCTATCTCTACTAACAAATACAAGAAATTAGCCGGCATGC  
 TGGCTGGCCTGTGGTCCCAGACTCGGGCAGCTGAGGAGAACATGGTGTGAACCCGGAGGCGGA  
 GCTGCACTGAGCCAGATCGCACCACTGCACTCCGGCTGGGGACGGAGCAGACTGTCTCAAAAAAA  
 AAAAAAAAGTCTCTGTAAGAGGTGAGGCCCTGGGTCAAACTCAGGTTCTGCCCTCAAATCACACAC  
 TCTTAGCAACCAGTCTTATGTTGATCTCTCCCTATGGGTGGAAGCCCTAGGGAACAGGTGGGGAA  
 AGGAGGTAAAGGGCAGGGCCAGAGTCAGGAGTAGGTGTCAAGAGCCCTAGGGTGGGGTGGAGAGGTCA  
 GGGCTCTACAGCAGCTGTGGCTGGATCAGGGTGTGGCATTATCTGGCCCCCATTGACCCAGTTGAC  
 ATCAGCTCCATGGGCAAGGGCATCAGCCATGGTGGGAAGAGATGGAGGATGCCAGCCTCGAAACAGT  
 AGGGCCCCAGGGTGCAGGCTTCCAGGTCTCAGAGGGGGGCTCTGTCGGGGGATTGGTTCTGTTAGG  
 GGGAGCAGCTCCAGTCTGGGAAGAAAACCCCTCAGCAGTGTGCACTAATGGTGTGAAGTGTGGGTTATGT  
 CTAATGATGGGAGCTGGGACTGTGGAGGGAAATAGTGTGATGCAAGTGTGGGTTATGT  
 TATGCACTGTCAGGACTCTCTAGGGTGTGGGGAGAGACGGCATCATCACCTCATCTGTCAACCACAC  
 TTGGCCTCAGCTCTAACCCCTGACGCCAGCCACCCCCACATTCTCTCATCTTAAATGTCACACTCCAC  
 TTGGCACCCCTTACCCCTGCCAGCCCACCCCCACATTCTCTCATCTTAAATGTCACACTCTGT  
 CGTAACCCCTGAAACGGCAGTCGGCTCCGACATTGTCAGGGAGGCCCTGGCTCACACTCTGT  
 GCTCCGGCGCTACCTGGCACGATGCCAGCACACAGCAGATGCTCAATGAATGCCGACCAACCCAT  
 ACCTGGCTGGATCTCAAGCTCCCTGGCGGGGCTGATGAGAAGGCTTGGGGCACAGGAGGCTGCC  
 CTTGGCGCCCCCGGCCACCTCTGCCCTCGAACATCTCAGGAGCTGGTCAAGAACCTCTCCACGT  
 ATTTCAGCTGAATCCAGGCCCTCTCTGCCCTGTGGAGGGAGAGACAGCAGTCAGGAGCTTCCCTCTG  
 CTCCAGGGTCCCCCATCTGGAGGCTAAACCCCAAGCTCACCGGGAGCAGCTGGGCCCCGG  
 TTCACGCCATGGCTCCACGCCGGGCTCATAGATCTGGTGTGATGACATTCCAGCTCACACATGA  
 GCTTCAGGAGGCCAGGCAGAGAACAGGAAGGTGGGGTGAGTGACTCCTCAGGGATCACGCC  
 CTGCACCGCCATGTCCTTGGCCACCCCAAGTTCTGCCCTCAATCTCACAATACGCTAAGTTACCTTC  
 ACTAGTTCTGGCTCCCATGAGTCAGGGTCAAGGGAGAGAACCCGACTTGGAGAAGGTGAACACCAAGG  
 AGGCCAGAGGGGGAGGGTCAAGGCCCTGTGCAAGGGGGAGCTGGCTGGGGAGCTGCTGCTGCTGAA  
 GACACTGGGAGGCAAGGCTGGCATGGGGCCCGTGCAGAGGTGCTGGCCAGGGCAGCTGCC

Figure 36 part - 20

CCATGTAACGCCATGAGCCTGGCCCTGGCAGGACTCTGCCTCGTCACCATTCCCTTCCCTT  
AGTTTCATTCAGGCCCTCATCACCCAGCCACCTCCCTCTCTAGTGACACTTGTGACACTTGGCC  
TGGACAACCTCTCCATGTCACCTCCCTCCACCAACTGAGGTGGGGGCGAGGGCCCTAGATACTTGC  
TAAGGCCTCATGACCGTTCTCTGCCTAGTCTACTGGCTCCCCACCCCTAGCAGCCTTGACCCCACA  
CTTCTCCAACCAAGCCAACAAATTCTGGGTATCCCCAATTCTGGCCAGACTAGGACACAGAGGGCTA  
GGCCGCCCTGGTCCAAGTGGCACCAGGGCAGAGGCTGGGCCAGGCCCTGGTACCCAGTGACAAAGCCAGAA  
GCTAAGAGAGGAAGGCCAGGACAGGGAGGAAGAGGGGGCCGGTGTGATGCCCTGTGATTGGAGCCGCACT  
GTGGCCGAAGGAGTGGGCTCCCGCATGGCCTGTGGAGTAACCTGTGGATGCCGAACACTGAATGC  
AGAGGTGACACCAAGGTGATGCTGGCCACTCCGGGCTGGCTCCGGCAGTCGAGCACTGGGCATT  
GCCATCCACACTCTGGACCTGGGCCAACAGTGGCCACTCCCCCAGGCCCTTCCCTGGCATTCCA  
CCAGAGGCCAGGGTGGCAGCAGGCCATGGCAGGTGCTTGAGGCCCTGGGGAGAGAGGGGAAGAAAAG  
GGTGGCCAAGGGCCTAGGGTAAAGGGTCCCCATCTCACAGGCAGGCCCTGGCTCCGACCCCCCAGGTTA  
AGGTACCTGGCCTGGACCCGGGGGTGTCATCAAGGCAGGCTGACTGAAGGAGGAATGCTGTC  
TGACAGCACTGACCCACAGCTGAGGAGGCCCTGAGTCAGCCTGGGAGGAGGAGGACCTAGTAGGA  
GGGTGAGGGAGATGGCAGAGGGCTGAGGCCCTGGAGCAAAGTGGCAGCATGGCAGACTGACATTCA  
GCCAGTATTCAACCAGTTCAGTTGCAATTGAAAGACTTCTGTACCTGGTAATATTCTCTAAATATC  
CCCCATCACCTGTACCCCTTCCACATGGCCCCCAGTCAGGCCCAAAGAATTAAAGTCTG  
GAGCTGATGGGGGCTTCCATTGTGGTGGGCCCTGCCTTCAGATTGCACTGGTAGATATTAGA  
GTATCACCCCTGGGATTGCACTCACTTGCTGGGACACCCACTCAAAGCAGAACGCCCTTCTGAGTC  
AGGGCAGAGTTCACTGTCAGAGAGCAAGGTGATCCACCCACAGTCACAGGGCCTGGCAGGATAAG  
GTGATAAGGGGCCAGATGTCAGCTGCCAGGCAAGAGCTGAGTCCTCTGGGCCAGGATCCAGGACCC  
AGGTCACACTCCTGTACTCTCTGGTAAACAGCTGGTAGCTCTGAATGGTGAACAGCAGCTGTAA  
GAGAAGGAAATCATTACAGACATAGGCACTTAAAGGATGAGGGACGGAAAGAGAGGCTGTGCTTTGCC  
ATGAGGATCTACTGAGAGGACAGACACCTGGGCTGACTGTTCCACGAGACATTCCAGAGAAGGGTGAC  
AATTGTGCAAGATTGGAACATCTAAAGGATGCTATTCTATCTTGACAAACCCAGATTCTATAGTTATG  
AAGACAACCTTCAGCAGATGGCAGTAAATTCTTTCTAATAAAATGTCTATTGCTACAATTAAAAA  
ATACTATTAGGCTGGGTCACACCTGTAATCCGACTTGGGAGGCTGATGGGGTGATGCC  
.CGAGGTAGGAGTTGAGACCACTGACCAATATGGTAAACTCCGCTCTACTAAAAATACAAAAAATT  
AGCCAGGCGTGGTGGCAGGGGCTATAATCCACCTACTTGGGAGGCTGAGGGGGAGAATCGCTTGAAAC  
CCAGGAAGCTGAGGTGCACTGAGCTGGGATCGCACCCTGTGCTGCCGCAACATAGCGAGGCT  
CCATCAAAAAGAAAAAAAAGAAAAAGAAAAAGAAAAGAATCTTGGGGCCAGGTACAGTGG  
CTCACGCCCTGAGTCCCAGCAAGTGGGAGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG  
CAGCCTGGGCAACATGGTGAACACCTGTTCTACAAAAAATTAGCCGAGCGTGATGGCACGC  
GCTGTGGTCCAGCTGTTAGGATGCTGAGGAGGGAGGACTCTGAACCTAGGGGATAGAGGTTGCAG  
TGAGCCGAGACTGCGCCACTGCACTGAGGCTGGCAACAGAGTGACACCCATCTCAAAAAAAACAG

Human CNTB1 mRNA sequence - var4 (public gi: 32879918) (SEQ ID NO: 40)  
ATGACGGTCAAGCTGGATTCAGGAGTGTCTCAAGGACTCACCCGTTCCGAGCCTCTATTGAGCTGG  
TGAAGCCGAAGTGTCAAGAATTGGAGACCCGTCGGAAAAGCTCTGAAACTGGGACTGGCTCCCTGGA  
AAGTGGCGCATTACCTTGCTGCCAGCCGCGCTTCGTTGCGCATTTGTGACCTGGCCGCTGGGT  
CCACCAAGGCCATGATGGCGAGTGTCTGGAAAAAATTCAACCGTGAGCCTGAACCAAGCTGACAGCC  
ATGCGGAGCTCTAGATGCCACCCACACACACTGCAAGCAGATCCAGACCCCTGGTCAAGGAAGGTCT  
GGGGGTTCCGAGAGGCTGCCGGGATTCTGGGGGGCTGAGGCGCTGGAGGCTGCCCTGACCCAC  
AACGCAAGGGTCCCAGGCGCCGGGGCCAGGAGGCAAGAGGCAGGAGCTGCTTGAGGACGGCTCGAG  
CTGGGTACGGGACGGCACTGGATTATGCCCTGCAAGTCAACGTGATTGAGGACAAGAGGAAGTTGA  
CATCATGGAGTTGTGCTGCGTTGGTGGAGGCCAGGCTACCCATTCTCAGCAGGCCATGAGGAGCTG  
AGCCGCTGCTCCAGATCGAAAGGAGCTGGGCCAGTGCACAGCTGGTCTTGAATTCAAGCACGAG  
AGAAGAGGGACATGGAGAGACACCTGCTGCAAGAACAGAGCTGGTGGAGGAGGCCAGAACC  
AAGCTTAAGAGGGGCCCTGGTGGCTGGTCACTTCAACGGCCAGCAACGCTTACCTGAGAAGTACAAGGACC  
AAGACCTGGAGCAGACGCTGGTCACTTCAACGGCCAGCAACGCTGGTGGAGGAGCTGGTGGAGGAGGCC  
CTGTGACTGTGGTGGATGACCTCGTCTGCACTGAAACTCTGCCCTGACTCAGAGGCCCTCTGAGCTG  
CTGCTTGAGGTGGTGTCCACCAGCAAGTCTGCCCTCCAGGCTGACTCAGAGGCCCTCTGAGCTG  
TGGGTAGTGTGTGAGGAGCATTGCTGCTGCCCTAGTCAACGGCTGGTGTGACAGCCCCCGGG  
GTCCAGGCCAGGGCTCAGGACACCTGGCATAGGCTCTGCTGCCACCCCTGGCTCTGGGAATGGCCAG  
GGGAAGGGAGGCCCTGGGGAGTCGGGACGGTGGCCAGGCTCAGAGTGTGGATGGCAATGCCAGTGC  
TGCAGCTGCCGGAGCCAGCCCCGGAGTGGGCCAGCATCAACCTGGTGTGACCCCTCTGACTCATGGGAGCC  
CCGGCATCCACAGGAGCCTGGTGTCACTTCTCAAAGTCCGGTCTCTGACCCCTGACTCATGGGAGCC  
AGAACTAGTGAAGGCTCATGTGTGAGCTGGGAAATGTCACTCAACCAGATCATGAGGCCCCGGTGGAG  
GCCATGGCAGTGAAGAAACCAGGGCCAGCTGCCAGGAGAAGGGAGGCTGGGATTCAAGCTAAAT  
ACGTGGAGAAGAAGTCTGACCAAGACTGCTGAGGAGCTGGGCCAGCATCAACCTGGTGTGACCCCTCTGACTCATGGGAGCC  
GGGGCAGGCCCTCTGAGGCCCCAAAGCCTTCCATCAGGCCCCGGCCAGGGAGCTTGTGAGATCCAAGGCCAGAG  
CCCCCTCTGAGGACCTGGGAAGGCTGCACTGGGGCCCTACTGTTTGAGCTGCTGGGATCCTCCAT  
CTCTCCCCACCATGGCTGATGCCCTGGCCATGGAGCTGATGTCAACTGGTCAATGGGGCAAGATAA

Figure 36 part - 21

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TGCCACACCGCTGATCCAGGCCACAGCTGTAATTCTCTGGCCTGTGAGTTCTCCTCCAGAACGGG  
GCGAACGTGAACCAAGCGGACAGTGCAGGGCGGGGGCGCTGCACCAACGCAACCATTCTGGCACACGG  
GGCTCGCTGCTGTTCTGAAACGGGGAGCTGATCTGGGGCTCGAGACTCTGAAGGCAGGGACCCCTCT  
GACCATCGCCATGAAACAGCCAACGCTGACATCGCACCCCTGCTACGACTGGCAAAGATGAGGGAGGCT  
GAAGCGGCCAGGGCAGGAGATGAGACGTATCTGACATCTCCCGCAGCTCTCCCATGGCGT  
CAGACGACCCGAGAAGCTGAGCGTGCAGTCACCTCCACACGCTGTAG

Human CENTB1 protein sequence - var1 (public gi: 32879919) (SEQ ID NO: 231)  
MTVKILDFFECLKDSPRFRASIELVEAEVSELETRLEKLLKLGLTGLLESGRHYLAASRAFVVGICDLARLG  
PPEPMMAECLEKFTVSLNHKLDSHAELLDATQHTLQQQIOTLVKEGLRGFREARRDFWRGAESLEAALTH  
NAEVPRRRAQEAAEAGAALRTARAGYRGRALDYALQINVIEDKRKFDMFVFVRLVEAQATHFQQGHEEL  
SRLSQYRKELGAQLHQLVLNSAREKRDMEQRHVLLQKELGGEPEPSLREGPGGLVMEGHLFKRASNAF  
KTWSRRWFTIQSNQLVYQKKYKDPTVVDLRLCTVKLCPDERRFCFEVVSTS KSCLLQADSERLLQL  
WVSAVQSSIASAQSARLDDSPRGPGQSGHILAIGSAATLGSMMARGREPGGVGHVVAQVQSVDGNQAC  
CDCREPAWEASINLGVTLCIQCQSGIHRSLGVHFSKVRSLTLDSSWEPELVKLMCELGNVIINQIYEARVE  
AMAVKKPGPSCSRQEKAEAWKFKLPEIRGRGGGRPRGQPVPKPSSRPRPGSLRSKPE  
PPSEDLGSLHPGALLFRASGHPPSLPTMADALAHGADVNWNNGQDNATPLIQATAANSLLACEFLQNG  
ANVNQADSAGRGPLHATILGHTGLACFLKRGADLGARDSEGRDPLTIAMETANADIVTLLRLAKMREA  
EAAQQAGDETYLDIFRDFSLMASDDPEKLSRRSHDLHTL

Human CENTB1 protein sequence - var2 (public gi: 34533015) (SEQ ID NO: 232)  
MSALAVSMAMVRGSLPSESRAPRSPRNRQASLERRARVSRRPNFSQPSSPCHHPPVWPRMVAWCSG  
PRPALS AWTFAFPFWRRNSQARREFCMKSRGVEGGIPSGGFQDV LGWRQFREWE GGVV

Human CENTB1 pray sequence - var1 (SEQ ID NO: 41)  
GCCTGGAGTACCCATACGACGTACCAAGATTACGCTCATATGGCATGGAGGCCAGTGAATTCCACCCAAG  
CAGTGGTATCAACGCAGAGTGGCATTATGGCCGGGAAGGAGGCCAGTGAATTCCACGCCAG  
AAGAAGTCTGACCAAGCTGCTGAGATTGAGGGCGAAGAGGTGGCCGGGGCGCCAAGGGGGCAGC  
CTCCTGTGCCCCAAAGCCTTCCATCAGGCCCGGCCAGGGAGCTTGAGATCCAAGCCAGAGCCCCCTC  
TGAGGACCTGGGAAGCCTGACCCCTGGGCCCTACTGTTTCGAGCGTCTGGCATCCTCCATCTTCCC  
ACCATGTCGGCCGCTCGGCCCTAGACGGTGGGCATCGATA CGGATC ATCGAGCTCGAGCTGCAGAT  
GAATCGTAGATACTGAAAACCCCGCAAGTCACTTCAACTGTGCATTGTC

Human CENTB1 pray sequence - var2 (SEQ ID NO: 42)  
CCGGCATGAGTACCATACGACGTACAGATTACAGCTNCAATTAGTGCACATGGAGGCCAGTGAATTCCA  
CCGAAGCAGTGGTATCAACGTCATGAGATGGCATTATGAGCCGGGGGGCAGCCTCTGAGCTTCCATCA  
CCGAAAGGCCCTCCATCAGGCNCGGCAGAGGCGAGCTTGAGATCCAAGCCAGAGCCCCCTCTGAGGA  
CCTGGGTAAGACCTGCTACCAACTAGTGCAGGCCCTACTGTTNCGAGCGTCTGGGCATACTCCATCTTCC  
CAACCGATGGNCTGATGCCCTTGGGCCATGGTAGTTGATGTCAACCTAGGTGTACAANTGTGAGTGG  
CCTNAAGGATAAAATTGCTCGTGCACAGACGGCTATCCAAGGCACAATAATCTAGCTAATTGTTACG  
TTCTTGG

Human CENTB1 pray sequence - var3 (SEQ ID NO: 43)  
CTGGAGTACCCATACGACGTACCAAGATTACGCTCATATGGCATGGAGGCCAGTGAATTCCACCCAAGC  
AGTGGTATCAACGCAGAGTGGCATTATGGCCGGGGGGCAGCCTCTGAGCTTCCATCA  
GGCCCGGCCAGGGAGCTTGAGATCCAAGCCAGAGCCCCCTCTGAGGACCTGGGAAGCCTGCACCCCTGG  
GGCCCTACTGTTCGAGCGTCTGGCATCCTCCATCTCTTCCACATGGCTGATGCCCTTGCCCATGG  
GCTGATGTCAACTGGGCAATGGGGCCAAGATAATGCCACACCGCCATCCAGGCCACAGCTGCTAATT  
CTCTTCTGGCCTGTGAGTTNNGCTCCAGAACGGGGCAGCTGAAACCAAGCGGACAGTGCAGGGGGGG  
CCCGCTGCACCAACGCAACCAATTCTGGCCACACGGGGCTGCCCTGCTGAGCTCTGAGAACGGGGAGCGGAT  
CTGGGGCTCGAGACTCTGAAGGCAGGGACCCCTGACCATGCCATGGAAACAGCCACGCTGACATCG  
TCACCCCTGCTACGACTGGCAAAGATGAGGGAGGGCTGAAGCGGCCAGGGCAGGCAGGAGATGAGACGTA  
TCTGACATCTCCCGCAGTCTCCCTCATGGCTCAGACNACCCNGAGAAGCTGANCCGTCGAGTCAT  
GACCTCCACACGCTGTGACCCGAGGGCCACGGGGCCGCGCTGCCCTCCTTCCGNCACCGGGCCCTT  
TGNCATNAAGGCTNCNGCTTCNAAAAAAAAAAAAAAA

Human CENTB1 pray sequence - var4 (SEQ ID NO: 44)  
CCGGCATGGAGTACCATACGACGTACAGATTACAGCTACATATGGCATGGAGGCCAGTGAATTCCAC  
CGCAATGCACTGGTATCAACGCACTGCAGATGGACCAATTATGGCCGGGGCAGTCCGTCATGATGT  
CCCCAAAGGCCCTCCATCAGGCCCGTGGCAGAGGAGGCTGAGATCCAAGCCAGAGCCCCACCCCTCTGA  
GGACCTGGGAAGCCTGCACCCNGGGCCCTACTGTTCGAGCGTCTGGACATACTCCATCTTCCC

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PCT/US04/06308

ACCGCATGGACTGATGCCCTGGCCAATGGACGCTGATGTCAACTGGTGTACAGAGTGTGAGTGGCAA  
GATTAACGTCTCATACCCGATGATCCATGCCACTAGTCTGTAATATCTCTCTGGCTGTGAGTT  
CTCCTCACAGAAACGGTGCCTGCAATCGAACNCAGCGATCGAGTTGCAGGGCTGGGCCCCNG  
TTGCACCGATCGAAGCAATTCTGGCANCTATCTGGGCTCGCCTGTCCTGANACGAGGGA  
GCTGATCTGGGCGCTGACGACTCTGAAG

Human CENTB1 pray sequence - var5 (SEQ ID NO: 45)

GCCATGGATACCATAACGACGTTACAGATTACGCTCATATGCCATGGGAGGCAGTGAATTCCACCCAAAGCAG  
TGGTATCAACGATGAGATGGTCAATTATGCCGGGGCAGGAGAAGGGCTGGATTACGCTAAATACG  
TGGAGAAGAAGTCCCTGACCAAGCTGCGTGAGAATTGAGGGGAAGAGGCTGGCCNGGGGCCAAGG  
GGCAGCCTCCCTGCCCCCTAAAGGCTTCCATGCCGGGGCAGTGAAGGAGCTTGTGAGATCAATG  
CCGAGTAGGCCCCCTCTGACGGACCTAGGGAAAGGCTGCTACCTTGAGGTGCCCTACGTGTTGAGCGTC  
TGGGATCCCATCTTTCCCACATGCCACACCGCTGATGCCCTGCCATGGAGCTGATGTCAACTGGGCAA  
TGGGGCCAAGATATGCCACACCGCTGATGCCACAGCTGCTACTTCTCTCTGGCCTGTTGA  
NTNTCTCCAGAACGGTGGGACACGTGAACCCAAGCGGNCACTGCCCGC

Human CENTB1 pray sequence - var6 (SEQ ID NO: 46)

GGCCATGGAGTACCATACGACGTACAGATTACGCTCATATGCCATGGGAGGCAGTGAATTCCACCGCAA  
GCAGTGGTATCAACGATGAGATGGACCATATTGGGGGAGTGCCTGGCATGGCAGCTGAAGAAATCCANGC  
CCAGCTGCTCCCGCAGGAGAAGGAGGCTGGATTACGGCATATAAGTAGCAGCTGGAGTAAGAAGTTC  
CTGTATCCAAGTCTGCCCTGACGAATTGAGGTGGCGAAGTATGGTGGCCGGGGCAGTCTCGAAGGAG  
GGTCAGCCACTCCCTGGTGCCGCCACGAACATGCCGTTCCATACCGCTCCCGGGCCACGGGATGGC  
ATTGAGATCCACATGCACAGAGCCCCGCCCTGAGGACCTGTGAGCAAGCTCATGGCAACCCCTGGGACC  
CTAGCGTAGTATTCTGAGCAGTCTGGCAATCGCTCACACTCTCTCCACGCTGAGCATGATGCGC  
GCTTGACCCATGGAGCTAGATGTCAACTGGGCAATGGGTGCAAGATAATGCCACACCGCTGATGATC  
CAAGCCCTACAGCTGCTAACGTTCTCTGGCTGTGAGTTCTCTCTCAGAACGGGGCAACTGTG  
AAGCCCAAGCGTGACAGTGCAGGGGGGGGGGGACTGCCACGCCAACCCACTTCTGGCNCAACNT  
GGGCTCGNCTTGCCTGTTCTGATCAC

Human CENTB1 pray sequence - var7 (SEQ ID NO: 47)

CNCGGCATGGAGTACCATACGACGTACAGATTACGCTCATATGCCATGGGAGGCAGTGAATTCCACCGCAA  
GCAGTGGTATCAACGATGAGTGGACCATTTGGGGAGCTCATGTGAGCATGGAAATAGTCATCA  
TCAACAAAGATCTATGAGGCCCCGGTGGAGGCCATGGCAGTGAAGAAACCCAGGGCCAGTCTGCTCCGG  
CAGGAGAAGGAGGCTGGATTACGCTAAATACGTTGAAGAAGAAGTCTCTGACCAAGCTGCCCTGAGATT  
CGATGGCAGAGGTGGCCGGGGCGCCCAANGGGCAGNCTCTGTGCCCTAAAGCCTTCCATCAGGC  
CCCAGCGCAGGGAGCTTGAGATCCAATGCCAGAGCCCCCGCTGAGGACCTGGGAAGCCTGCAACCTG  
GGGCCCTACTGTTCTGAGCGTCTGGGATCCTCCATCTTCCCACCATGGCTGATGCCCTGCCATGG  
AGCTGATGTCAACTGGGCAATGGCCAGAAGATAATGCCATCACCAGTGTACCCAGGCCACAGCCTG  
CTAANTCTACTTCTGGCGTGTGAGTTCTCTCCAGGAACGGGGCAACCGTGGACCAAGGGGACNN  
GTGGGGCCGGGGCCGCTGCCACACGCCAACCTCTGGCATACGGGCTGCC

Unigene Name: DDEF1 Unigene ID: Hs.386779

Human DDEF1 mRNA sequence - var1 (public gi: 31873727) (SEQ ID NO: 48)  
GAGACAAAGTTACAAAATTGAGAAAGAGAAAAGAGACGCAAAACAACATGGGATGATCCGCACAG  
AGATAACAGGAGCTGAGATTGCGGAAGAAATGGAGAAGGAAGGGCGCTTTCTGCTCCAAATGTGTGA  
ATATCTCATTAAAGTTAATGAAATCAAGACAAAAAGGGTGTGGATCTGCTGAGAATCTTATAAAGTAT  
TACCATGCACAGTGAATTCTTCAAGATGGCTGAAAACAGCTGATAAGTGTGAAACAGTACATTGAAA  
AACTGGCTGCTGATTTATATAATATAAAACAGACCCAGGATGAAGAAAAGAAACAGCTAACTGCACTCCG  
AGACTTAATAAAATCCTCTTCAACTGGATCAGAAAGAAGATTCTCAGAGGCCAGGGAGGGATACAGC  
ATGCATCAGCTCAGGGCAATAAGGAATATGGCAGTGAAGAAGGGTACCTGCTAAAGAAAAGTGACG  
GGATCCGGAAAGTATGGCAGAGGGAGTGTCTAGTCAGAAAGATGGGATCTGACCATCTCACATGCCAC  
ATCTAACAGGAACCCAGCAAGTGAACCTCTCACCTGCCAAGTAAAACCTAATGCCAAGACAAAAAA  
TCTTGTGACCTGATATCACAATAATAGAACATATCCTTCAAGGAGGAGGATTATGTAGCAT  
GGATATCAGTATTGACAAATAGCAAGAAGAGGGCTAACCATGGCTTCCGGAGAGCAGAGTGCAGGG  
AGAGAACAGCCCTGGAAGACCTGACAAAAGCCATTATTGAGGATGTCCAGGGCTCCAGGGATGACATT  
TGCTGCATTGGCTCATCAGAACCCACCTGGCTTCAACCAACTTGGTATTTGACCTGTATAGAAT  
GTTCTGGCATCCTAGGAAATGGGGTTCATATCTCTCGCATTCACTTGTGAAACTAGACAAATTAGG  
AACTTCTGAACCTCTGCTGGCCAAGAATGTAGGAAACAAATAGTTTAATGATATTATGGAAGCAAATT  
CCCAGCCCTCACCAAAACCCACCCCTCAAGTGTATGACTGTACGAAAAGAATAATCACTGCAAAGT  
ATGTAGATCATAGGTTCAAGGAAGACCTGTTCAACTTCATCAGCTAAACTAAATGAATTGCTTGAGGC

CATCAAATCCAGGGATTACTGCACTAATTCAAGTCTATGCAGAAGGGGTAGAGCTAATGGAGCCACTG  
 CTGGAACCTGGGAGCTGGGAGACAGCCCTCACCTGCCGACTGCCAGATCAGACATCTC  
 TCCATTGGTTGACTTCCTTGACAAAAGCTGTGGAACTGGATAAGCAGACGGCCCTGGAAACACAGT  
 TCTACACTACTGTAGTATGTACAGTAAACCTGAGTGTGGAGCTTGTGCTCAGGAGAAGCCCCTGTG  
 GATATAGTTAACCGGCTGGAGAAACTGCCCCTAGACATAGCAAGAGACTAAAAGCTACCCAGTGTGAAG  
 ATCTGCTTCCOAGGCTAAATCTGAAAGTCAATCCACAGTCCACCGTAAATATGAGTGGAACTTCG  
 ACAGGAGGAGATAGATGAGAGCAGTGTGATCTGGATGACAAACCAAGCCCTATCAAGAAAGAGCGCTCA  
 CCCAGACCTCAGAGCTCTGCCACTCCAGCATCTCCCCCAGGACAAGCTGGACTGCCAGGATTCA  
 GCACTCCAAGGGACAAACAGCGGCTCTCTATGGAGCTTCCAACCAGATCTCGTGTCCACAAGCAC  
 AGACTCGCCCATCACCAACCACGGAGGCTCCCCCTGCTCCTAGGAACGCCGGAAAGGTCCAAGT  
 GGCCACCTTCAACACTCCCTAAGCACCCAGACCTCTAGTGGAGCTCCACCCATCCAAGAAGAGGC  
 CTCTCCCCCACCACCGGACACAAGAGAACCTATCCGACCCCTCCAGGCCACTACTCATGGGCC  
 AAACAAAGCGCAGTCTTGTGGGTAACGATGGGGTCCATCTCTTAAGTAAGACTACAAACAAAGTT  
 GAGGAGCTATCCCAGCAGTCAGGACCCAGTCTGCAAAGACTGCCCTGGCCAAGAGTTCTCTAAAC  
 TACCTCAGAAAGTGGACTAAGGAAAACAGATCATCTCCCTAGACAAGGCCACCATCCGGCC  
 CTTTCAGAAATCATCACAGTGGCAGAGTTGCCACAAAAGCCACCCACTGGAGACCTGCCCC  
 ACAGAACTGGCCCCAAGCCCCAAATTGGAGATTGCCGCTAAGCAGGAGAACCTGCCCC  
 AGCTGGGGGACTGCCACCCAAACCCCCACTCTCAGACTTGCTCCAAACACAGATGAAGGACCTGCC  
 CCCAAACACAGCTGGAGACCTGCTAGCAAAATCCCAGACTGGAGATGTCACCCAGGCTCAGCAA  
 CCCCTGAGGTACACTGAGTCACCCATTGGATCTATCCCCAATGTGCTAGTCCAGAGACGCCATCC  
 AAAAGCAAGCATCTGAAAGACTCCAAGCACCTCAGCCTACTCTGCCAGAGACGCCGTA  
 AGCTGGGGAAAATAAAAGTGAGGCGAGTGAAGACCAATTATGACTGCCAGGAGACAACGAT  
 GAGGAGCTCACATTCACTGGAGGAAGTGATTATCGTCACAGGGAGAGGAGCAGGAGTGGTGGATTG  
 GCCACATCGAAGGACAGCCTAAAGATTGTCCACATCCTCATGCAAGACTGCTGCCCTCATGTA  
 GCAAAACGCAGAACCTAAAGATTGTCCACATCCTCATGCAAGACTGCTGCCCTCATGTA  
 CAGTGTGTATATAGCTGCTGTTACAGAGTAAGAAACTCATGAAAGGCCACCTCAGGAGGG  
 GTGTGTAAATATCTGTTCTGCCTCACAGTATGAGGTAAGCCTGGAGCCGGCGGCC  
 ACTGGTTGCCAAAGCCATCTGGCATCTAGCACTTACATCTATGCTGTTCATCTGTCTGACTA  
 CAAAAATAGGAGTATAGGAACCTGCTGGCTTGCAAAATAGAAGTGGCTCAGCAACCGTTGA  
 GAATTGACTCTGTTCTAACATGCACTATTCTCAATTGTGTTACTGAAACATTAGCAAAGAGG  
 TGGTTCTGTTCCAGGTGAAACTTTAGCTCCATGACAGACAGCAGCTGAGTTATCTGT  
 TTACAGCTACAAAACCTACTTGGTATTATTACAGAAAAGTCTGCTAGTTAAATGTA  
 ACTGGTTGCCAAAGCCATCTGGCATCTAGCACTTATGGCATTTCACAGCCTCATGCA  
 GACAAGTGGATTATACTGCTTATGAGTGCCTCCCTGATATATTACCTCATTATG  
 CAACAAACATGCAACTGCAATTAGTCAAAACTTACCTGAAATCTGCTTTATAAGGAA  
 TAGTATGGATAAGTGGAAATTGACATTTTAAACTTGATTGCCATTAAAGCAGAA  
 ATTATAAGTGGCTTAATCACTGGCTTCTCAAGAGTATGGATTGACATTGTTG  
 TCTCAGATGTGTTGAAGCATCCATTGCACTTATTATTCTAGTTTCTAG  
 TAAACTTTAAAGATTATTCAAGATGAAATTAAAAGTCACACCTTCA  
 TAACTGGTCTTCCAGTGGCTCATGTGCTTCTGGCACTACATTGCT  
 TAAGTGGGAACTTACAGTGTGTTATTGGAAAGTGATTAAAGCA  
 ATTGCTTCTGCTTCTAGTGTGCTTCTGGCAATGAGTGAGAGATG  
 TAATTTCACAGAAGCAGCACAGGAAACCTTACGGGAAAGCCT  
 CACAACCTCCAAACCCAAACCTTACGGGAAAGCCTTCTCC  
 GTTCTGTTAAGTGGTTGCTATACAAACTTTGAATAGCCAC  
 TAATAAAACCTTGTGCTTCTGGCAATGAGTGAGAGATG  
 TAATTTCACAGAAGCAGCACAGGAAACCTTACGGGAAAGCCT  
 TGAATTTCACACCAAAACAGAGCATGAGGAACCAGTGT  
 GAGATGCTGGGATGGAAGTCTGCACTGAGGTTGCT  
 CCTCGGTACTGAAGCCACACCGATGTCCGGATGGAAGT  
 CTGCACTGAGGTTGCTCAGTGTCCGGTCA  
 TCATTACACATTAAAGAGCTGTTCTTCTGTGG  
 CCTAGACTCTTCACTGATCTC  
 AAAATAAAACTGGTTTTTCAAAAAAAAAAAAAAA

Human DDEF1 mRNA sequence - var2 (public gi: 6330853) (SEQ ID NO: 49)  
 GAAAAGAGAGCACGAAAACACATGGGATGATCCGCACAGAGATAACAGGAGCTGAGATTGGAAAGAA  
 ATGGAGAAGGAAAGGCGCTCTTCAGCTCAAATGTGTGAATATCTCATTAAAGTTAATGAAATCAAGA  
 CCAAAAGGGTGTGGATCTGCTGCAAGTCTTAAAGTCAATTACCATGCAAGTGTCAATTCTTCAAGA  
 TGCTGAAACAGCTGATAAGTTGAAACAGTCAATTGAAAAACTGGCTGCTGATTATATAATAAAAA  
 CAGACCCAGGATGAAGGAAAGAAACAGCTAATGCACTCCGAGACTTAATAAAACCTCTCTCAACTGG  
 ATCAGAAAGAATCTAGGAGAGATTCTCAGAGCCGGCAAGGGAGGATACAGCATGCA  
 TAAGGAATATGGCAGTGTGAAAGAGGGTACCTGCTAAAGAAAAGTGA  
 CGGGATCCGGAAAGTATGGCAGTCAGCAAGAATGGGATTCTA  
 ACCATCTCACATGCCACATCTAACAGGCAACCAGCCA

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AGTTGAACTTCTCACCTGCCAAGTAAAACCTAATGCCGAAGACAAAAAAATCTTGACTGTATCATCACA  
TAATAGAACATATCACTTTCAGGCAGAAGATGAGCAGGATTATGTAGCATGGATATCAGTATTGACAAAT  
AGCAAAGAAGAGGCCCTAACCATGGCCTTCCGTGGAGACAGACTGCCGGAGAGAACAGCCTGGAAGACC  
TGACAAAAGCCATTATTGAGGATGTCAGCGCTCCAGGGATGACATTGCTGCGATGTTGCTCATC  
AGAACCCACCTGGCTTCAACCAACTTGGTATTGACCTGTATAGAATGTTCTGCATCCATAGGGAA  
ATGGGGGTTCATATTCTGCATTCACTGTTGGAACTAGACAAATTAGGAACCTCTGAACTCTTGTGG  
CCAAGAAATGTAGGAAACAATAGTTTAATGATATTATGGAAGCATAACCCAGCCCCCATACCAAAACC  
CACCCCTCAAGTGATATGACTGTACGAAAAGAATATCACTGCAAAGTGTAGATCTAGGTTTCA  
AGGAAGACCTGTTCAACTCATCAGCTAAACTAAATGAAITGCTGAGGCCATCAAAATCAGGGATTAC  
TTGCACTAATTCAAGTCTATGAGCAGAAGGGTAGAGCTAATGGAACACTGCTGGAACCTGGCAGGAGCT  
TGGGGAGACAGCCCTCACCTTGCCTCCGAACTGCAGATCAGACATCTCTCCATTGGTGTGACTTCTT  
GTACAAAACGTGGGAACCTGGATAAGCAGACGCCCTGGGAAACACAGTCTACACTACTGTAGTATGT  
ACAGTAAACCTGAGTGTGAGCTTGTAGCAGGCCACTGTGGATATAGTTAACCAAGGGCTGG  
AGGAAACTGCCCCTAGACATAGCAAAGAGACTAAAGCTACCCAGTGTGAAGATCTGCTTCCAGGCTAAA  
TCTGGAAAGTTCAATCCACAGTCCACGTAGAAATATGAGTGGAACTTCGACAGGAGGAGATAGTGAGA  
GGCATGATGATCTGGATGACAAACCAAGCCCTATCAAGAAAGAGCGCTCACCCAGACCTCAGAGCTCTG  
CCACTCCTCCAGCATCTCCCCCAGGACAAGCTGGCACTGCCAGGATTCAAGCTCCAGGACAAACAG  
CGGCTCTCTATGGAGCCTTACCAACCAGATCTCGTTCCACAAGCACAGACTGCCACATACCAA  
CCACGGAGGCTCCCCCTCTGCTCTCTAGGAACGCCGGAAAGGTCAACTGCCACCTTCACACTCCC  
TCTAAGCAACCAGACCTCTAGTGGCAGCTCCACCTATCCAAGAAGAGGCCCTCCCTCCCCAACACCCGG  
CACAAGAGAACCTATCCGACCTCCAGGCCACTACCTCATGGGCCCCAACAAAGGCGCAGTCTT  
GGGGTAACGATGGGGTCCATCTCTCAAGTAAGACTAAACAAAGTTGAGGAGACTATCCAGCAGTC  
GAGCACCAGTCTGCAAAGACTGCCCTGGCCCAAGAGTCTCTCTAAACTACCTCAGAAAGTGGCACTA  
AGGAAACAGATCATCTCCCTAGACAAAGCCACCATCCGCCAGGACCTGCCCTAACACCACAGCTGGGAG  
TGGCAGAGTGGCCACAAAGGCCACCCAGGAGACCTGCCCTAACAGCAGACTGCCCTAACAGCC  
CCAAATGGAGATTGCGCTTAAGCCAGGAGAACTGCCCTGGGGCAAGGCCACAGACTGCCCTGG  
AAACCCAACTCTAGACTTACCTCCAAACACAGATGAAGGACCTGCCCTAACACCACAGCTGGGAG  
ACCTGCTAGCAAATCCAGACTGGAGATGTCTCACCAAGGCTCAGCACCCCTCTGAGGTACACTGAA  
GTCACACCCATTGGATCTATCCCAAATGTGCACTGCCAGAGACGCCATCCAAAAGCAAGCATCTGAAGAC  
TCCAAGCACCTCACGCCACTCTGCCAGAGACGCCCTACCACTGCCAGAAAATCAATCGGGAAA  
ATAAAGTGAGGCGAGTGAAGACCAATTATGACTGCCAGGCAGACAACGATGACGAGCTCACATTCA  
GGGAGAAGTGATTATGTCACAGGGAAAGAGGACCAAGGAGTGGGATGGCCACATCGAAGGACGCC  
GAAAGGAAGGGGGCTTTCCAGTGTCTTGTATCATCTCTGTGACTAGCAAACCGAGAACCTTAAG  
ATTGTCCACATCTCATGCAAGACTGTCGCCCTCATGTAACCTGGGCAAGTGTGTTATAGTGT  
TTACAGAGTAAGAAACTCATGGAAGGCCACCTCAGGAGGGGATATAATGTGTTGAAATATCCTGT  
GGTTTCTGCCCTCACAGTATGGGAGTGGCTGCCCTGGGCCCTACTGGTTGCCAAAGCCATC  
CTTGGCATCTAGCACTTACATCTCTATGCTGTTCTACAAGAAACAAACAAAATAGGAGTATAGGAA  
CTGTCGGCTTGTCAAATAGAAGTGGCTCCAGCAACCGTTGAAAGGCATAGAATTGACTCTGTTCTAAC  
AATGCACTATTCTCAATTGTTACTGAAAATGCAACATTAGCAAAGAGTGGGTTCTGTTCTCAGGTG  
AAACTTTAGCTCCATGACAGACCAAGCCTGTAGTTATCTGTGACACAGTTACAGCTACAAAACCTAC  
TTGGTATTTATTACAGAAAAGTGTCACTTAAATGTAAGTGTATTCTCTCAGAAAATATTCACTGAC  
CCAAAACCTTTATGGCATTTACAATGCAACACAGCCTCATGCAAGTTAGACAAGTGTGATTATACTGT  
CTTATGAGTGCCCCCCCCTGATATATTACCTCATTATGCAAAATAACATATCTCTGACTATTGAA  
CAAAGTTAAAACACATATGAGGTTCAAATTTCAGGAACCAAGGACTGCCCAAGGAAATTAGGCT  
ATTACGCAATTAGGCTTACCTGGAATCTGCTTTATAAAAGGAATTATAAGGTTGCAACAATATTGTTCTA  
GTACATTTTAAACTTGATTGCCATTAAAGCAGAAAATTATAAGGTTGCAACAATATTGTTCTAATCA  
CTGGCTTCTCAAGAGTATGGATTGACATATTGTTGTTATGAAATGCACTGTTGAAAGCAT  
CCATTGCACTCCATTTTATTATTCTTAGTTGTTCTGACAAAGGACTGCCCAAGGAAATTAGGCT  
CAAGATGAATTAAAGTCACCCCTCACACAGTTCCCTACTGTATGAGAATCCAGGTGCTGAAACCA  
AGTGTGTTCTTCCATGCTTTGTTAAACCCCAATTATAGATAATTTCAGTCTTAAGCTCTG  
ACCTTCAAGTCATTGATACCAAGTTTGAAACGCTGCTATGAAATTGCACTGTTGAAAGCACTCT  
TCTCAGTTTCTTCTCCATCCCAGCCATGTTATCAGATCCTTAAGAACATTGTATTCTAGTCTT  
CAGTCTGAATTGGAAAAGAATGCAATAGTGTACTCCACAGTCAGTGGAACTGTTCCCTGAGTCCGAG  
GCTCATGTGTCATTCTGCCACTACATTGCTTAAATTGCTATTGTTGCAACAGCACAGAAAAC  
TTAAGCAGAGAACTTGGCAATGAGTGGAGAGTGTAAATTTCACAGAACAGCACA  
TTAGGAAAAGGCCCTCTTCCATGCTTACAGTGTCACTGAGAATATTGTTGCTTAAGTGGT  
ATACAAACTTGAAATGCCACCTAATAAAATAAAACCTGCTGAGAACCTGAAAC  
TTATTGGAAAAGTGTATTAAAGCAATTGCTTCTCAGTGTGAGGGTGTGACTGGCAG  
AGCATGAGGAACCAAGTGTGACATGCTGGGGTGTGACTGGCAGCTTAGCAGCTCGGT  
CAGTGTGGGATGAGTGTGCACTGAGGTTGCTAGTGTCCGGTCAATTCA  
GCTTAAAGAGCTGTTCTTCTGTTGCTAGACTCTTCACTGATCTCAA  
AAAAAAAAAAAAACAAAAACACAAAGCTGCACTGCTAAAATTACATGGAGTTAGT  
GTCTATTCTTCTCCCTTGTGAGCAACTACAGCATTAAACACCTTTTTCTAGTTT  
AAAAAAAAAAAAACAAAAACACAAAGCTGCACTGCTAAAATTACATGGAGTTAGT

Figure 36 part - 25

PCT/US04/06303

TTGGGTTTCCATCAGGAATTGAGTTCTCTAACCCAGCTTACTGTGGGACATAGGAAAACTC  
AGTAGAAATACCTTGGTGAATTGAGTTAAGTCTGATCTTAACTCACTAAGCCACTAT  
CTGCAATTGTAATTATAGTATTGAGATATGGAACCTTATGAAAAAAATACCAAATTAGTT  
CTTTTCCCCAGAGGGAAAGTTATGTTCTGAAATAGTGTGTCTTATTTACTGTTGAACAGCAAT  
TGCTATTATTATTATTGCTAGAACATGTTAGAATCTGCTAGTGTAACTGTTAATGTGA  
TGCGAATTCTCATCTGGATGTTACCATCAAACATCACTACACTTGTCAATTGACATTT  
CAGTTTCAGTACTGTATGTTAATTCTACTTTTAAATTAAATTGCTTTAAATAAACATA  
TTCTCAGTTGATCCC

Human DDEF1 mRNA sequence - var3 (public gi: 7689053) (SEQ ID NO: 50)  
GATTGCCATTAAGCAGAAATTATAAGGTTGCAACAATATTGTTCTAATCACTGGCTTCATCAAGAGT  
ATGGATTGACATATTGTTATGCAATGCACATCTCTCAGATGTTGAAGCATCCATTGCAATT  
TATTATTCTTAGTTGTTCTGGACAAATTAAACANNTTAAAGATTATTCAAGATGAATTAAAA  
GTCAACCCCTCACACAGTTCCACTGTATGAGAATCCAGGTGCTGAAACCAAGTGTCTTCCCA  
TGCTTTGTTAAACTCCAATTATAGATAATTCCAGTCTAACGCTGTGACAGTCAATT  
ATAACCAAGTTTGAACGCTGCTATGAAATTGCACTGTGAAAGCACTCTCCCTCTCAGTTGTTCA  
TCCTGAGCCAGAATCAAAAAAAAAAA

Human DDEF1 mRNA sequence - var4 (public gi: 16552319) (SEQ ID NO: 51)  
CAGAACCTTAAGATTGTCACATCCTCATGCAAGACTGCTGCCCTCATGTAACCCGGCACAGTGTGT  
ATATAGCTGCTGTTACAGAGTAAGAAACTCATGGAAGGCCACCTCAGGAGGGGATATAATGTTGTTG  
TAAATATCCTGTTCTGCCTTACCAAGTATGAGGTAGCCTCGGACCCGGCGCCTTACTGGTT  
GCCAAAGCCATCCTGGCATCTAGCACTACATCTCTATGCTGTTACAAGCAAACAAACAAAAATA  
GGAGTATAGGAACGTGCTGGTTGCAAATAGAAGTGGTCTCAGCAACCGTTGAAAGGCATAGAATTGAC  
TCTGTTCTAACATGCACTATTCTCAATTGTTACTGAAATGCAACATTAGCAAAGAGGTGGTTCT  
GTTTCCAGGTGAAACCTTGTAGCTCATGACAGACCAGCCTGAGTTATCTGTTACACAGTTACAGCT  
ACAACAAACCTACTTGGTATTACAGAAAAGTGTCAAGTTAAATGTAAGTGTATTCTTCAGCAA  
ATATTCACTGACCCAAAACCTTTATGGCATTTACAATGCAACACAGCCTCATGCAAGTTAGACAAGTG  
GATTATACTGCTTATGGTGGCCCGCCCTGATATACTCATTATGCAAAATAACATATCTTCA  
TGACTATTGACAAAAGTTAAACACATATGAGTTCAAAATTCTAGGAACCAAGGACTGCCAGAAAAT  
ATTAGCCTCATACATGCAATTGAGCTTACCTGAAATCTGCTTTATAAAGGAATAGTATGG  
ATAAGTGAATTGACATTTTAAACTGATTGCAAGGATGGACATATTGTTATGAAATGCACTCTCAGAT  
GTGGTGAAGCATCCATTGCAATTGTTATTCTAGTTGTTCTGGACAAATTAAACTT  
TAAAGATTATTCAAGATGAATTAAAAGTCAACCCCTCACACAGTTCCACTGTATGTTAGAATCCAG  
GTGCTGAAACCAAGTGTCTTCCATGCTCTTGTAAACCCCAATTATAGATAATTCCAGTCT  
TAAGCTCTGTCACCTTCAGTCAATTCTAACCAAGTTGAAACGCTGCTATGAAATTGCACTGTGAA  
AGCACTCTCCCTCTCAGTTCTTCACTCCAGCCATGTTATCAGATCTTAAAGAACATTGTT  
AGTCTTACATCAGTGTGAAATTGAAATGCAATTAGTGTACTCCACAGTCAGTGGAACTGTT  
CCTGAGTCGGAGGCTCATGTCATTGCACTACATTGCTTAAATTGCTATTGCAACAGCACAG  
AAAACAAATTTAAAGCAGAGAATCTGGCAATTGAGAGATGTTAATTTCAGAAGCACAAC  
CCAACCCAACCCCTGGAAAAGCCCTTCCCATGTTACAGTGTCAAGTAAATTAGTCTGCT  
TAAGTGGTTGCTATAACAAACTTGAATAGCCACCTAATAAAACCTGCAAGACAAACCTGCAA  
TTTATCAGCTGTTATTGAAAGTGAATTGCAATTGCTTCTCAGTGTCAAGGGCACATGTA  
CACACCAAACAGAGCATGAGGAACCAAGTGTGACATGCTGGTTGTGACTGGCAGCTTAGCAG  
CTGAAGGCCACACAGTGTCCGGATGGAAGTCTGCATCTGAGGGTGTCACTGTCCC  
ACATTTAACTGCAATTAAAGAGCTGTTCTTCTGTTCACTGATCTCAA  
CTGGTTTTTC

Human DDEF1 mRNA sequence - var5 (public gi: 18088817) (SEQ ID NO: 52)  
CAGCTACAAAACCTACTTGGTATTACAGAAAAGTGTCAAGTTAAATGTAAGTGTATTCTTCA  
GCAAAATATTCACTGACCCAAAACCTTTATGGCAATTACAATGCAACACAGCCTCATGCAAGTTAGAC  
AAGTGGATTATACTGTTATGAGTGGCCGCCCTGATATACTCATTATGCAAAATAACATATC  
TTTCATGACTATTGACAAAAGTTAAACACATATGAGTTCAAAATTCTAGGAACCAAGGACTGCCAG  
AAAATATTAGCCTCTACATTACGCATGCAATTGAGCTTACCTGAAATCTGCC  
TATGAGTGTGAAAGCATCATTGCAATTGTTATTATTTCTTGTGTTATGAAATGCA  
ATATTGTTCTAAATCAGTGTGAAAGTGTGATTGACATATTGTTATGAAATGCA  
CAGATGTGTTGAAGCATCATTGCAATTGTTATTATTTCTTGTGTTATGAA  
ACTTTAAAGATTATTCAAGATGAATTAAAAGTCAACCCCTCACACAGTTCC  
TCCAGGTGCTGAAACCAAGTGTGTTCTTCCATGCTTGTAAACCCCAATT  
AGTCTTAAAGCTGTCCACCTCAAGTCATTACAACCAAGTTTGAACGCTG  
TGAAAGCACTCTCCCTCATCCCAGCCATGTTATCAGATCCTTAAGAACATTG  
TGAAAGCACTCTCCCTCATCCCAGCCATGTTATCAGATCCTTAAGAACATTG

Figure 36 part - 26

ATTCAGTCTTTACATCAGTCTGAATTGGAAAAGAATGCAATAGTTGACTCCACAGTCAGTGGAAC  
TGTCCCTGAGTCCGAGGCATGTGCAATTGGCACTACATTGCTAAATTGCTATTGGCAACAG  
CACAGAAAACATAATATTGAAAGCAGAGAATCTTGGCAATGAGTGAGAGATGTTAAATTGCAACAGCAC  
AACTCCAACCCAACCCTAGGAAAAGCCCTTCCATCGTACAGTGCAGTGAATATTAAATTAGTT  
CTGCTTAAGTGGGTCTATACAAACTTGAATAGCCACCTAATAAATAAAACCTGCA  
AAATATTGATAGCTGTTATTGGAAAGTGATTAAAGCAATTGCTTCCTCAGTGTCAAGGGCACATGTGA  
ATTCCACACCAAACAGAGCATGAGGAACCAAGTGCAGATGCTGGGGTTGTACTGGCAGCTTAGCAGCCT  
CGGACTGAAGGCCACACCAAGTGTCCGGATGGAAGTCTGCATCTGGAGGTGCTCAGTGTCCCAGTCATTCA  
TTTACACATTAACTTGCAATTAAAGAGCTGTTCTTCTGGCCTAGACTCTTCACTGATCTCAAA  
ATAAAGTGGTTTACAAAAAAAAAAAAAA

Human DDEF1 mRNA sequence - var6 (Predicted by Proteologics) (SEQ ID NO: 53)  
TTTCGACCGCTGGGTTTATTCCCTTGAAGACTTGGAAAGATTGTCATTCACTGCAATGATGGTCA  
GCCCTAAGAAGCATGCAGGAGCCATATAAGAGTCACAAGGCTCTAGACCAAGATAGAACAGCCCTCAG  
AAAGTGAAGAAGTCTGTAAGGAAATATAATTCTGGTCAAGATCATGTCACAAAATGAAGAAAACATAG  
CACAAGTTCTGATAAGTTGGAGTAATTGTTAAGTGCAGACAACCCGACCTGGCACCGCGTTGT  
CAAGTTCTACTCTTACAAAGGAACTGTCACACTGCTGAAAATCTGCTCCAGGGTTGAGCCACAAT  
GTGATCTCACCTGGATCTTGTAAAGGAGACCTAAAGGGAGTCAAAGGAGATCTCAAGAACGCAT  
TTGACAAAGCCTGGAAAGATTGAGACAAAGTTACAAAATTGAGAAAGAGAAAAGAGACGCA  
ACAACATGGGATGATCCGCACAGAGATAACAGGAGCTGAGATTGCGGAAGAAATGGAGAAAGGA  
CTCTTTCAGCTCCAAATGTGTGAATATCTCATTAAAGTTAATGAAATCAAGACCAAAAAGGGTGTGGATC  
TGCTGCAGAATCTTATAAAAGTATTACCATGCACAGTGCACATTCAAGATGGCTGAAAACAGCTGA  
TAAGTTGAAACAGTACATTGAAAACGGCTGCTGATTATAATAAAAACAGACCCAGGATGAAGAA  
AAGAAACAGCTAAGTGCACCTGGAGACTTAATAAAATCCTCTTCACTGGATCAGAAAGAAATCTAGGA  
GAGATTCTCAGAGCCGGCAAGGAGGATACAGCATGCTCAGGCGAATAAGGAATATGGCAGTGA  
AAAGAAGGGGTACCTGCTAAAGGAAAGTGCAGGGGATCAGGAAAGTATGGCAGAGGAGAAGTGTTCAGTC  
AAGATGGGATTCTAACCATCTCACATGCCACATCTAACAGGCAACCAGCCAAGTGTGACCTTCTCACCT  
GCCAAGTAAACCTAACATGCCAAGACAAAAATCTTGCACCTGATATCACATAATAGAACATATCACTT  
TCAGGCAGAAGATGAGCAGGATTATGAGCATGGATATCAGTATTGACAATAGCAAAGAAGAGGCCCTA  
ACCATGGCTTCCGTGGAGAGCAGAGTGGGGAGAGAACAGCCTGGAAGACCTGACAAGGCAATTATTG  
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Human DDEF1 protein sequence - var1 (public gi: 31873728) (SEQ ID NO: 233)  
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LSTQTSSGSSTLSKKRPPPPPGHKRTLSDPPSPLPHGPPNKGAVPWGNDDGPSSSKTTNKFEGLSQQS  
STSSAKTALGPRVLPKLQPQVALRKTDHLSLDKATIPPEIFQKSSQLAELPQKPPPGDLPPKPTELAPKP  
QIGDLPPKPGELPPKPQLGDLPPKPQLSDLPPKPQMCKDLPPKQLGDLLAKSQTGDSVSPKAQQPSEVTLK  
SHPLDLSPNVQSRDAIQKQASEDSNDLPTLPETPVPLPRKINTGKNKVRVKTIYDCQADNDELTIE  
GEVIIVTGEEDQEWIGHIEGQPERKGVPVSVFHILSD

Human DDEF1 protein sequence - var3 (public gi: 7689054) (SEQ ID NO: 235)  
MNAHLSVLKHPLHPFFIIFLVLFLDKFICXXKRLFKMNLKVNPShSFPTVCRIQVLKPSVFPMIFVKLQ  
L

Human DDEF1 protein sequence - var4 (public gi: 18088818) (SEQ ID NO: 236)  
MNAHLSVLKHPLHPFFIIFLVLFLDKFICXXKRLKDYSR

Human DDEF1 protein sequence - var5 (Predicted by Proteologics) (SEQ ID NO: 237)  
MIGQPQEACRSHHKSHKALDQDRTALQVKKSVAIYNSGQDHVQNEENYAQVLDKFGSNFLSRDNPDLG  
TAFVFKFSTLTKELSTLLKNLQLSHNVIFTLDSSLKGDLKGVKGDLKKPFDKAWKDYETKFTKIEKEKR  
EHAKQHGMIRTEITGAEIAEEMEKERRLFQLOMCEYLIKVNEIKTKKGVDLLQNLIKYYHAQCNFFQDGL  
KTADKLKQYIEKLAADLYNIKQTQDEEKQLTALRDLIKSSLQLDQKESRRDSQRGGYSMHQLQGNKE  
YGSEKKGYLLKKSDGIRKVWQRRKCSVNGILTISHATSNRQPAKLNLLCQVKPNAEDKKSFDLISHNR  
TYHFQAEDEQDYVAWISVLTNSKEEALTAFRGEQSAGENSLEDLTKAIEEDVORLPGNDICCDCGSSEP  
TWLSTNLGILTCTIECSGIHREMGVHISRIQSLDCLKGTSELLAKNVGNNSFNDIMEANLPSPSPKPTP  
SSDMTVRKEYITAKYVDHRSRKTCSAKLNELLEATKSRDLLALIQVYAEVGVELMEPLLEPGQELGE  
TALHLAVRTADQTSLHLVDFLVQNCGNLDKQTAALGNTVLHYCSMYSKPECLKPLRSKPTVDIVNQAGET  
ALDIAKRLKATQCEDLLSQAKSGKFNPVHVEYEWLRQEEIDESDDDDLKKSPPIKKERSPRPQSFCHS  
SSISPQDKLALPGFSTPRDKQRLSYGAFTNQIFVSTSTDSPSPTTEAPPPLPPRNAGKGPTGPPSTLPLS  
JTQSSGSSTLSKKRPPPPPGHKRTLSDPPSPLPHGPPNKGAVPWGNDDGPSSSKTTNKFEGLSQQSST  
SSAKTALGPRVLPKLQPQVALRKTDHLSLDKATIPPEIFQKSSQLAELPQKPPPGDLPPKPTELAPKPQI  
GDLPKPGELPPKPQLGDLPPKPQLSDLPPKPQMCKDLPPKQLGDLLAKSQTGDSVSPKAQQPSEVTLKSH  
PLDLSPNVQSRDAIQKQASEDSNDLPTLPETPVPLPRKINTGKNKVRVKTIYDCQADNDELTIEGE  
VIIIVTGEEDQEWIGHIEGQPERKGVPVSVFHILSD

Human DDEF1 pray sequence - var1 (SEQ ID NO: 54)  
GCGCCGCCATGGTAGTACCCATACGACGTACCACTATTACGCTCATATGGCCATGGCAGGCCAGTGAATT  
CCACACCAAGCAGTGGTATCAACGCAGAGTGGCACAAAAGCCACGCACGCTGGANGACCTGCCCAAC  
AGCCCACAGAAACTGGCCCCAAGCCCCAATTGGAGATTGCGCCTAACGCCAGGAGAACTGCC  
AACACAGCTGGGGACCTGCCACCCAAACCCAAACTCAGACTTACCTCCCAAACACAGATGAAGGA  
CCTGCCCCCACCACAGCTGGAGACCTGCTAGAAAATCCCAGACTGGAGATGTCTCACCCAAAGGCT  
CAGCAACCCCTGAGGTACACTGAAGTCACACCCATTGGATCTATCCCAAATGTGCAGTCCAGAGACG  
CCATCCAAAAGCAAGCATNTGAAGACTCCAACGACCTCACGCCCTACTCTGCCAGAGACGCC  
GCCCANAAAAATCANTACGGGAAAANTAAANNTGAGGCAGTGAAAACCTTAATGACTGCCAGGC  
ANNATGACAAGCTCNATTCTNCAGGGAAAAGTGTATCGTNCAGGGAAAAGNNCNGGATTGTTGGTCC  
NNCAATTTCNTCCNNTNCNACTATTANAATNGCNNGCAGGNNCAATNGAACNCNAANNNGNN  
GAAAANAGGNNTTNNCAAGGANCTNNNTNGTTTNTCCNAAANNTNNNTNGNNNTTTTTNC  
NCNCNTTTNTNNAAAACNCNGNANNNNNNCAAGGNNCCNTNTNNCNTNGGGGGGGNNNG  
NNTNNNGGGNNNANACCCCCC

Unigene Name: EIF3S3 Unigene ID: Hs.58189 Clone ID: 3GD\_18

Human EIF3S3 mRNA sequence - var1 (public gi: 2351379) (SEQ ID NO: 55)  
GAAAGATGGCGTCCCGAAGGAAGGTACCGGCTACTGCCACCTCTCCAGCTCCACCGCCGGCGCAGC  
AGGGAAAGGCAAAGGCAAAGGCGCTCGGGAGATTCAAGAAGAAGGACAAGGAACCTGAAGTTGTTCAAGGAGTGCTTTGG  
GTATTAAGATAATCAAACATTATCAAGAAGAAGGACAAGGAACCTGAAGTTGTTCAAGGAGTGCTTTGG  
GTCTGGTTGAGAAGATCGGCTTGAATTACCAACTGCTTCTCCCTCAGCACACAGAGGATGATGC  
TGACTTTGATGAAGTCCAATATCAGATGGAAATGATGCCAGCTTCCAGTAAACATTGATCATCT  
CACGTGGGCTGGTATCAGTCACATACTATGGCTATTGTTACCCGGGACTCCTGACTCTCAGTTA  
GTTACCAAGCAGTGCATTGAAGAACTGTCGTTCTCATTATGATCCCATAAAACTGCCAAGGATCTCT  
CTCACTAAAGGCATACAGACTGACTCCTAAACTGATGGAAGTTGTAAGAAAAGGATTTCCCTGAA  
GCATTGAAAAAGCAAATATCACCTTGAGTACATGTTGAAGAAGTGCCATTGTAATTAAAATTAC  
ATCTGATCAATGTCCTAATGTGGGAACTTGAAGAAGTCAGCTGTCAGATAAACATGAATTGCTCAG

CCTGCCAGCAGCAATCTGGGAAAGAACATCTACAGTTGCTGATGGACAGAGTGGATGAAATGAGCAA  
GATATAGTTAAATACAACACATACTGAGGAATACTAGTAAACAAACAGCAGCAGAAACATCAGTATCAGC  
AGCGTCGCCAGCAGGAGAATATGCAGCGCCAGAGCCGAGGAGAACCCCCGCTCCCTGAGGAGGACCTGTC  
CAAACCTCTCAAACCACACAGCCGCTGCCAGGATGACTCGCTGCTCATTCAGGCCAGATAAACACT  
- TACTGCCAGAACATCAAGGAGTTCACTGCCAAAACCTAGGCAAGCTCTCATGCCAGGCTCTCAAG  
AATACAAACAACAAAGAAAAGGAAGTTCCAGAAAAGAAGTAACTGAACCTTGAAAGTCACACCAGGGC  
AACTCTGGAAAGAAAATATATTGCATATTGAAAAGCACAGGAGTTCTTAGTGTATTGCCGATTG  
GCTATAACAGTGTCTTCTAGCCATAATAAATAAAAAATAAAAAATAAAAAATAAAAAATAAAAAATAAAAA  
AAAAAATAAAAAATAAAAAAT

Human EIF3S3 mRNA sequence - var2 (public gi: 21751901) (SEQ ID NO: 56)  
AGCGCGTAGCAAGAGACTGGCAGTATAGTAGTCAGTGATAATATTGAGCCTTAA  
TATGTTCCAGACACTGCTCTAAGTGATTACCTTACATTATTCCCTGAATGTTATAATTCCAAGTGA  
AAGAAGGAAATGATATATTGGATAGCTATGAGTGGGGAGGTTGTACTGGCTGCTTCCATAAAGAAAT  
TAAGCACGTTACGAAGGGCACGTAGTTGTTAGTGTCTGGAAACCAGTTCTGTCCTGAAGTCAAAT  
GTTCTTGCTACACCACCATAGAAACTAACGTCACTCAGGAACCATTGTCAGGGCAAAGGGTGCACCAT  
TTTGCATTTCCTCCTGCTTAGGACCATCTAAATCACTCGCATGGAGTGTGTTGAAAGAAACTCTCAAGA  
GCTTCGTTGCCTAGAGTCAGAATTCTAACCTTGAGTCCTGGTTTGCCACAAACCAAGCCGTTGAT  
CTGGGCAACTCCCAGAGAAAGCTGGGTTCAACTTCCACTGTCAAACACTGGTTGAGGTCTAGATAAGT  
TTCAAGTACTCTTTATGTGCATGGTCTCTGACATAGGAAGACTACATACTGGGCCAGTAACAGGAAGG  
CACAAAGCTGACTGGAGGTTAAAAATTACTGGTCAATTGATAATGAGGAGAATGAATCAGAAAATT  
TCAAGTTCTCCCGTGGCTAACGTGAGTATCCACTTCAAGATCATTCCATCGGAAAGAGGTGAAAATG  
TACAGTAGGCATGCACAAAGGATACGCCCTGGAAAGAAGATGGCGTCCCGCAAGGAAGGTACCGCTCTA  
CTGCCACCTCTCCAGCTCCACGCCGGCGCAGCAGGGAAAGGCAAAGGCCAGGGCTCGGGAGATT  
AGCCGTGAAGCAAGTGCAGATAGATGGCCTGGTATTAAAGATAATCAAACATTATCAAGAAGAAGGA  
CAAGGAACCTGAAGTTCAAGGAGTGCTTGGGTCTGGTGTAGAAGATCGGCTGAAATTACCAACT  
GCTTCCTTCCCTCAGCACACAGAGGATGATGCTGACTTTGATGAAGTCCAATATCAGATGGAAATGAT  
GCCGAGCCTCGCCATGTAACATTGATCATCTCACGTGGCTGGTATCAGTCCACATACTATGGCTCA  
TTCGTTACCGGGCACTCTGGACTCTCAGTTAGTACAGCATGCCATTGAAAGATCTGCTGTTCTCA  
TTTATGATCCCATAAAACTGCCAAGGATCTCTCACTAAAGGCATACAGACTGACTCCTAAACTGAT  
GGAAGTTGTAAGAAAAGGATTTCCTGAGCAGTGAAGTCAAATATCACCTTGAGTACATG  
TTGAGAAGTGGCATTGTAATTAAACATCTGATCAATGTCCTAATGTTGGAAACTTGAAAAGA  
AGTCAGCTGTCAGATAAACATGAATTGTCAGCCTGCCAGCAGCAATTGAGGAAATCTACA  
GTTGCTGATGGACAGAGTGGATGAAATGAGCCAAGATATAGTTAAATACAACACATACTGAGGAATACT  
AGTAAACAAACAGCAGCAGAAACATCAGTATCAGCAGCGTCGCCAGCAGGAGAATATGCAGCGCCAGAGCC  
GAGGAGAACCCCCGCTCCCTGAGGAGGACCTGTCAAACCTTCAAACACCACAGCCGCTGCCAGGAT  
GGACTCGCTGTCATTGCAAGGCCAGATAAACACTTACTGCCAGAACATCAAGGAGTTCACTGCCAAAAC  
TTAGGCAAGCTTCACTGGCCAGGCTTCAAGAATACAACACTAAGAAAAGGAAGTTCCAGAAAAG  
AAGTTAACATGAACTCTGAAAGTCACACCAGGGCAACTCTGGAAGAAATATATTGCATATTGAAAAGC  
ACAGAGGATTCTTAGTGTATTGCCGATTTGGCTATAACAGTGTCTTCTAGCCATAATAAATAAA  
ACAAAATCTTG

Human EIF3S3 mRNA sequence - var3 (public gi: 12653234) (SEQ ID NO: 57)  
GGCACGAGGATGGCGCCCGCAAGGAAGGTACCGGCTCTACTGCCACCTCTCCAGCTCCACCGCCGGCG  
CAGCAGGGAAAGGCAAAGGCAAAGGCGCTCGGGAGATTAGCCGTGAAGCAAGTGCAGATAGATGGCCT  
TGTGGTATTAAAGATAATCAAACATTATCAAGAAGAAGGACAAGGAACGTGAAGTGTCAAGGAGTGCTT  
TTGGGTCTGGTTGAGAAGATGGCTTGAAATTACCAACTGCTTCTTCCCTCAGCACACAGAGGATG  
ATGCTGACTTTGATGAAGTCAAATATCAGATGGAATGATGCCAGGCTTCTGCCATGTAACATTGATCA  
TCTTCACGTGGCTGGTATCAGTCCACATACTATGGCTCATTGCTTACCCGGCAGCTCTGGACTCTCAG  
TTTAGTTACCACTGCACATTGAAAGAATCTGCTGTTCTCATTATGATCCCATAAAACTGCCAAGGAT  
CTCTCTCACTAAAGGCATACAGACTGACTCCTAAACTGATGGAAGTTGTAAGAAAAGGATTTCCTCCC  
TGAAGCATTGAAAAAGCAAATATCACCTTGGAGTACATGTTGAAAGAAGTGGCAGATAAACATGAATTG  
TCACATCTGATCAATGCTTAATGTTGGAAACTTGAAAAGAAGTCAGCTGTTGCAAGATAAACATGAATTG  
TCAGCCTGCCAGCAGCAATCTGGGAAAGAATCTACAGTTGCTGATGGACAGAGTGGATGAAATGAG  
CCAAGATATAGTTAAATACAACACATACTGAGGAATACTAGTAAACAAACAGCAGCAGAAACATCAGTAT  
CAGCAGCGTCGCCAGCAGGAGAATGCAAGCGCCAGAGCCAGAACCCCCGCTCCCTGAGGAGGACC

TGTCCAAACTTCAAACCACAGCCGCTGCCAGGATGGACTCGCTCATTGCAGGCCAGATAAA  
CACTTACTGCAGAACATCAAGGAGTTCACTGCCAAAACCTAGGCAAGCTCTCATGCCAGGCTCTT  
CAAGAATACAACAACTAAGAAAAGGAAGTTCCAGAAAAGAAGTTAACATGAACCTCTGAAGTCACACCA  
GGGCAACTCTTGAAGAAATATATTGCATATTGAAAAGCACAGAGGATTTCTTAGTGTATTGCCGAT  
TTGGCTATAACAGTCTTCTAGCCATAATAAAAACAAAATCTTGAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Human EIF3S3 protein sequence - var1 (public gi: 12653235) (SEQ ID NO: 238)  
MASRKEGTGSTATSSSTAGAAGKGKGKGGSGDSAVKQVQIDGLVVLKIIKHYQEEQGTEVVQGVLLGL  
VVEDRLEITNCFPFPQHEDDADFDEVQYQMEMMRSLRHVNIHDHLHVGWYQSTYYGSFVTRALLDSQFSY  
QHAIEESVVLIIYDPPIKTAQGSLSLKAYRLTPKLMEVCKEKFDSPEALKKANITFEYMFEEVPIVKNSHL  
INVLWELLEKKSADVADKHLLSLASSNHLGKNLQLLMDRVDEMSQDIVKYNTYMRNTSKQQQQKHQYQQR  
RQQENMQRSRGEPLPPEEDLSKLFKPQPARMDSLIAGQINTYCQNIKEFTAQNIGKLFMQALQEY  
NN

Unigene Name: EPS8L2 Unigene ID: Hs.55016

Human EPS8L2 mRNA sequence - var1 (public gi: 21264615) (SEQ ID NO: 58)  
GTGACGGCCATTACCAATCGCAACCTGTCGCTCAGGTTCTCTCTCCCGGCCGCC  
CGGCCCGGCCGCCGAGCGTCCCACCCGCCGGAGACCTGGCGCCCCGGCCGAGCGCAACAGAC  
GGACGCACCGCGAGCGCGAGGGAGACGGCGAGCGCGGGCGAGGCAGGTGTGGGACAGGCACT  
GGCTCTAGACCGGGGCCACACTGAGGTCTGCCCTCTCCGCTGGCCGCCACCAAGACACCATGAGCCA  
GTCGGGGCCGTGAGCTGCTGCCGGTGCCACCAATGGCAGCCTGGGGCCGACGGTGTGGCCAAG  
ATGAGCCCCAAGGACCTGTTGAGCAGAGGAAGATTTCAACTCCAACTCAGTCATGCACGGAGACCT  
CGCAGTACACAGTCCAGCACCTGCCATCATGGACAAGGGCAAGCCATACGTCAGGAGACGA  
CGCCATCCGAAGCTGGTGCAGCTGAGCTCAAGGAGAAGATCTGGACCCAGGAGATGCTGTCAGGTG  
AACGACAGTCGTTGCGCTGCTGGACATCGAGTCACAGGGAGGAGCTGGAAGACTTCCGCTGCCACGG  
TGCAGCGCAGGCCAGACGGCTCTCAACAGCTGCGCTACCCGCTGTGCTGCTGTCAGGACTC  
GGAGCAGAGCAAGCCGAGTGTGACTTCCACTCTTCACTGCGATGAGGTGGAGGAGCTGGTGACGAGGAC  
ATCGAGGCGCTTGGCCACTGCCGCTGGCAAGAAGATGCGCCAGACCCCTGAAGGGACACCAGG  
AGAAGATTGGCAGCGCAGTCATCCTGCCCTCTCCCAGGGCCGGCCCATCCCTTCCAGCACCG  
CGGGGGATTCCCCGGAGGCCAAGAATCGCTGGCCGAGGTGCCACTCAGCAGGCCAGGTTTCCGC  
CGTGGGAGTCGCAAGGAGGAGCCGGGGCGTGTGGCTCAGAAGATAGAGAAGGAGACGCAAATCCTCA  
ACTGCCCCCTGGACATCGAGTGGTTGTGGCCGGCTGAGAAGGAGCCAGGGCTTCAAGCAGCT  
GAACCAAGCGAAAAAGGGGAAGAAGAAGGGCAAGAAGGCGCCAGCAGAGGGCTCTCACACTGCGGCA  
CGGCCCCCTCTGAGGGCGAGTTCATCGACTGCTTCCAGAAAATCAAGCTGGCGATTAACCTGCTGGCAA  
AGTCGAGAACATCCAGAACCCAGCGCCGGAGCTGCGACTTCTCTGGGCTCTGGACCT  
GATCGTCAACACCTGCAAGTGGCCAGACATCGCACGCTCCCTCTCCGGACTCTGAGATGCC  
GTGGACTTCCCTGCCGCCACCTGGTCCCTAAGGAGATGTCGCTGTGGAGTCAGTGGAGAGAGCTGGA  
TCCGGCCCCCTTCCAGTGGCCGGAGGCCACAGGTGCCCCCTACGTGCCAAGTTCACAGCGGCTG  
GGAGCCTCTGTGGATGTGCTGAGGAGGCCAGTGGAGGGCTGGCGCTGCCCATCGAG  
GAGGTGAGTCAGTGAAGGCCAGTCCATAAGAAACTCCAGAACGACAGCCCCACTCAGAGGCCACCC  
CCCCGGGGATGCCCTACCACAGTCAGCTCCCCACATACTCACAGGGCTACCAGCCAACACAGCCAT  
GGCCAAGTACGTCAAGATCCTGTATGACTTCACAGCCCAGTGGCAAGCTGCGCAGCCGAGCGGCGAGGAT  
GAGGTGCTCTAGAGGTGCTGGAGGACGCCGGCAGTGGAGCTGCGCAGCCGAGCGGCGAGGGGT  
ACGTGCCCTGCAACATCTAGGCAGGGCGCAGCGAGGAGCAGCCGGCCGGCTCGAGCAGGCCGCTCA  
GAAGTACTGGGGCCCCGCCAGCCGACCCACAAGCTACCCCAAGCTCCGGGGAAACAAAGACGAGCTC  
ATGCAGCACATGGACGAGGTCAACGACGAGCTCATCCGGAAAATCAGAACATCAGGGCGCAGGCCACAGA  
GGCAGCTCCCGCTGGAGGCCAGCCAGGCCAGCCGCTCACCTACGAGTCGGTCCGGACGAGGT  
CCGGCCCTGGCTGGAGCCAAGGCCCTTCAGCCCGGATCTGGAGAACCTGGCATCTGACCGGGCCG  
CAGCTCTCTCCCTCAACAAGGAGGAGCTGAAGAAAGTGTGGCGAGGAGGGCTCCGGCTACAGCC  
AGCTCACCATGCAGAAGGCCCTTCTGGAGAAGCAGCAAAGTGGTCAGGCTGGAGAGAACACTCATGAACAA  
GTTTCATTCCATGAATCAGAGGAGGGGGAGGACAGCTAGGCCAGCTGCCCTGGCTGGGGCTGGGCG  
GGGGAGCCACCCACAATGCATGGAGTATTATTTATATGTGTATGTATTGTATCAAGGACACGGA  
GGGGGTGTGGTGTGGCTAGAGGTCCCTGCCCTGTCTGGAGGACAAACGCCATCCTTAGGCCAAACAG  
TACCCAAGGCCCTCAGCCACACCAAGACTAATCTAGCCAAACCTGCTGCTGGTGGTGCCAGGCCCTTG  
TCCACCTCTCTTGAGGCCACAGAACACTCCCTGGGCTGGGCCCTTCTCTGGCCCTCCCTGTGCACCT  
GGGGGGCTCTGGCCCTGTGATGCTCCCCCCTACCCACTTCTACATCCACACCCAGGGTGA  
GCTGGAGCTCCAGGCTGGCCAGGCTGAACCTCGCACACAGCAGAGTCTGCTCCCTGAGGGGGCCGG  
GAGGGGCTCCAGCAGGAGGCCGTGGTGCCATTGGGGAAAGCAGACACACACTTCACCTG

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AAGGGCCGACAACGCAGGGACACCGTGCCTGCTTCAGACACTCCCAGGCCCACTCTTACAGGCCAGG  
ACTGGAGCTTCTCTGGCCAAGTTTCAGGCCAATGATCCCCCATGGTGTGGGGTGTGGTGTGCTT  
GGTGCCTGGACTTGAGTCTACCCCTACAGATGAGAGGTGGCTGAGGCACCAGGGCTAACAAACCA  
GTTAAGTCTCCAGGAAAAAAAAAAAAAA

Human EPS8L2 protein sequence - var1 (public gi: 21264616) (SEQ ID NO: 239)  
MSQGAVSCPGATNGSLGRSDGVAKMSPKDLFEQRKKYSNSNVIMHETSQYHVQHLATFIMDKSEAITS  
VDDAIRKLVLQSSKEIWTQEMLLQVNDQSLRLLDIESQEEILEDFPLPTVQRSQTVLNQLRYPVSLVLLVC  
QDSEQSKPDVHFVFFHCDEVEAELVHEDIESALADCRILGKMRPQTLKGHQEKIRQRQSILPPPQGPAPIPF  
QHRCGDSPEAKNRVGPQVPLSEPGFRRRESQEEPRAVLAQKIEKETQILNCAALDDIEWFVARLQKAAEAF  
KQLNQRKKKGKKKAPAEVGVLTLRARPPSEGEFIDCFQKIKLAINLLAKLQKHIONPSAAELVHFLFGP  
LDLIVNTCSGPDIARSVSCPLLSRDAVDFLRGHLPVKEMSLWESLGESWMRPRSEWPREPVQVPLVPKFH  
SGWEPPVDVLQEAPWEVEGLASAPIEVSPVSROSIRNSQKHSPTSEPTPPGDALPPVSSPHTHRQYQPT  
PAMAKYVKILYDFTARNANELSVLKDEVLEVLEDGRQWWKLRSRSGQAGYVPCNILGEARPEDAGAPFEQ  
ACQKYWPASPHTKLPSPFGNKDELMQHMDEVNDELIRKISNIRAQPQRHFRVERSQPVSQPLTYESGP  
DEVRAWLEAKAFSPRIVENLGILTGPQLFLSNEELKKVCGEEGVRVSQLTMOKAFLEKQQSGSELEEL  
MNKFHSMNQRRGEDS

Human EPS8L2 pray sequence - var1 (SEQ ID NO: 59)  
TCNTNCGCCCATGGNAGTACCCATACGACGTACAGNATTACGCTCATATGGCCATGGNAGGCCAGTG  
AATTCCACCCAAAGCAGTGGTATCAACGCAGAGTGGCATTATGGCGGGGGAAACAAAGACGAGCTCATGC  
AGCACATGGACGAGGTCAACGACGAGCTCATCCGAAAATCAGCAACATCAGGGCGCAGCCACAGAGGCA  
CTTCCCGTGGAGCGCAGGCCAGCCAGCCGTGAGCCAGCGCTCACCTACGAGTCGGTCCGGACGAGGTCCGC  
GCCTGGCTGGAGCCAAGGCCCTCAGCCCGGGATCGTGGAGAACCTGGCATCCTGACCGGGCCGCAGC  
TCTTCTCCCTCAACAAGGAGGAGCTGAAGAAAGTGTGCGGCCAGGAGGGCGTCCGCTGTACAGCCAGCT  
CACCAGCAGAAGGCCCTCCTGGAGAACAGCAAAGTGGTCCGAGCTGGAAGAACTCATGAACAAGTT  
-CATTCATGAATCAGAGGGGGGGAGGACAGCTAGGCCAGCTGCCCTGGCTGGGCTGCCAGGGGG  
AAGCCCACCCACAATGCATGGAGTATTATTTTATATGTGTATGTATCAAGGACACGGAGGGGG  
GGTGTGGTGTGGCTANAGGTCCCTGCCCTGTTGGNAGGCACAAACNCCCATNCCTTAGNCCAAANAG  
TNACCCAANGGCCNAACCCAANCAAGNTTATTTNANNCAAACNNNGNTGNTTGGTGGTNCCAACC  
CCNTTGTGGTGCNNNNCCNTGTNCANCNTNNNTTNGNCNCNANAANTNCCTNGGGTNGGGGN  
CNTTTTTNTNN

Human EPS8L2 pray sequence - var2 (SEQ ID NO: 60)  
CGAGCGCCGCCGGNATAACCCATACGACGTACAGNATTACGCTCATATGGCCATGGNAGGCCAGTGAAT  
TCCACCCAAAGCAGTGGTATCAACGCAGAGTGGCATTATGGCGGGGGAAACAAAGACGAGCTCATGCAGC  
ACATGGACGAGGTCAACGACGAGCTCATCCGAAAATCAGCAACATCAGGGCGCAGCCACAGAGGCACTT  
CCGGCGTGGAGCGCAGGCCAGCCGTGAGCCAGCGCTCACCTACGAGTCGGTCCGGACGAGGTCCGC  
TGGCTGGAGCCAAGGCCCTCAGCCCGGGATCGTGGAGAACCTGGCATCCTGACCGGGCCGCAGCTCT  
TCTCCCTCAACAAGGAGGAGCTGAAGAAAGTGTGCGGCCAGGAGGGCGTCCGCTGTACAGCCAGCTCAC  
CATGCAGAAGGCCCTCCTGGAGAACAGCAAAGTGGTCCGAGCTGGAAGAACTCATGAACAAGTTCAT  
TCCATGAATCAGAGGAGGGGGAGGACAGCTAGGCCAGCTGCCCTGGCTGGGCTGCCAGGGGGAG  
CCCACCCACAATGCATGGAGTATTATTTTATATGTGTATGTATCAAGGACACGGAGGGGTG  
TGGTGTGGCTANAGGTCCCTGCCCTGNTGGAGGCACACNCCCATCCTAGGCCAAACANTACCNAGG  
NCTNANCCACACCAANACTATTTAACCNAACTNGNTGNTGGTGGTGCNNCCNTGGTGTNCCNC  
CCNTTNTCCNTTTTGNGNCCNAAAATTCTNTGGGCTGGGCTTNTTTGGCNCCCTNNNNCN  
TNGGGGTCTGGNCCNTNNNNNTNTNCCCTNCCCCCTNTNNNTNT

Human GOCAP1 mRNA sequence - var1 (public gi: 10438060) (SEQ ID NO: 61)  
GATACGTGGCTGCCGTCTGCCCCGTGAGGAGGTGCAGCAGCCGGAGATGGCGCGGTGCTGAACGCAG  
AGCAGACTCGAGGTGTCCGTGACGGCCTCACGCTCAGCCCCGACCGGAGGAGCGGCCCTGGGGCGGAGGG  
CGCCCCGCTGCTGCCGCCACCGCTGCCACCGCCCTGCCACCTGGATCGGTCGCGGCCGGCGCCTCA  
GGGGAGCAGCCCAGGCCGGAGGGGGAGGGGGCTGGGGCGGGAGGGAGGGCGCCGGCTGGAGCAGC  
GCTGGGGTTTCGGCTGGAGGAGTTGTACGCCACTCGCCTCTCAAAGAAAAAGATGGCAAAGC  
ATTTCATCCAACCTATGAAGAAAAATGAAGCTGTGGCATAAGCAAGTCTTATGGGCCATAT  
AATCCAGACACTGTCTGAGGTTGGATTCTTGATGTGTTGGGAAATGACAGGAGGAGAGAATGGCAG  
CCCTGGGAAACATGTCTAAAGAGGATGCCATGGTGGAGTTGTCAAGCTTAAATAGGTGTTGCCATCT  
CTTTCAACATATGTTGCGTCCCACAAATAGAGAAGGAAGAGCAAGAACAAAAAGGAAGGAGGAAGAG  
GAGCGAAGGCCGTGAAGAGGAAGAAAGAGAACGCTGCAAAAGGAGGAAGAGAACGTTAGGAGAGAAG  
AAGAGGAAAGGCTCGACGGAGGAAGAGGAGACGGATAGAAGAAAGGCTCGGTTGGAGCA

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GCAAAAGCAGCAGATAATGGCAGCTTAAACTCCAGACTGCCGTGCAGTCAGTATGCAGCCAA  
CGATCCAGGGAACTACGAACAGCAGCAAATTCTCATCCGCGAGTGCAGGAGCAACACTATCAGCAGT  
ACATGCAGCAGTTGATCAAGTCCAGCTTGACAGCAACAGGAGCATTACAGAAACACAGGAAGTAGT  
AGTGGCTGGGCTTCCCTGCCATCATCAAAAGTGAATGCAACTGTAACAGTAATATGATGTCAGTT  
AATGGACAGGCCAAAACACACACTGACAGCTCCGAAAAGAACCTGAGAAGCTGAGAAGAAGCCC  
TGGAGAATGGACCAAAAGAATCTCTCCAGTAATAGCAGCTCCATCCATGTGGACACAGACCTCAGATCAA  
AGACTTCAAAGAGAAGATTGAGCAGGATGCAAGTCCGTGATTACAGTGGGCCGAGGAGAAGTGGTCACT  
GTTGGAGTACCCACCCATGAAGAAGGATCATATCTTTGGGAAATTGCCACAGACAATTATGACATTG  
GGTTGGGCTGATTTGAATGGACAGACTCTCCAAACACTGCTGTCAGCGTGCATGTCAGTGA  
CGATGACGACGAGGAGGAGAAGAACATCGGTTGTGAAGAGAAGACCAAAAGAACATGCCAACAGCCT  
TTGCTGGATGAGATTGCTGCTGTGACCGACTGTCAGGAGGTGATGCTGGCAGCCATCAAT  
ATCCAGGGAGAGGAGTCTATCTCTCAAGTTGACAACCTACTCTTGCTGGCGGCTCAAATCAGTCTA  
CTACAGAGTCTATTATACTAGATAAAATGTTGATCAAAGTCTGGAGTCTAGGGTTGGCAGAACAGATGA  
CATTAATTGAAATTCTTTACTTTGTGGAGCATTAGAGTCACAGTTACCTTATTGATATTGGT  
CTGATGGTTGTGAACTCTGCTGGGAACTCAAAATTCTTGAGACTCTTAGCATTACACTTTGGG  
TAAAGGAGATTCTCAGACTCATCCAGCCCTGGGTGCTGACCAGCAGAGTCACTAGTGGATGCTGAAGT  
TACATGAGCTACATGTTAAATATTAAAGTCTCCAAACACCCCCAACGTTGACCTTACCCGGCTG  
ATGGTTAGCCCCCTGCTGCCCTGCTCATGTCATGAGACGCCGTAGTTACAGTGTCTTAATTG  
AATCCATAAGTTAACAGTCTATATCAGGTGCAGCTGGCTTGATTAAAGGCCATTTTAAACTAAAA  
ACTCACACCTCACAGATTATAAAAAAAAAAAAAAA

Human GOCAP1 mRNA sequence - var2 (public gi: 15826851) (SEQ ID NO: 62)  
GGAAGTCGATACTGCTGGCTGCCCTCTGTCGGCGCTGAGGAGGTGCGAGCAGCCGGAGATGGCGCGGTGCTG  
AAGCGAGCGACTCGAGGTGTCGGCTGACGGCCTCAGCCTCAGCCCCGGACCCGGAGGAGCGGCTGGGG  
CGGAGGGCGCCCGCTGCTGCCGCCCGCTGCCACCGCTGCCACCTGGATCCGGTGCAGGGCCCGGG  
CGCCTCAGGGGAGCAGCCCCGGAGGCGGGCTGGGGCGCGGGAGGAGGCGCGGGCGCTG  
GAGCAGGGCTGGGGTTCCGGCTGGAGGAGTTGTCAGGCCCTGGCACTGCCTTCTCAAAGAAAAAGATG  
GCAAGCATTTCATCCAACCTATGAAAGAAAATTGAAAGCTTGCACTGCATAAGCAAGTTCTATGGG  
CCCATATAATCCAGACACTTGTCTGAGGTTGGATTCTTGATGTTGGGGAAATGACAGGAGGAGAGAA  
TGGCAGCCCTGGAAACATGCTAAAGAGGATGCCATGGTGGAGTTGTCAGCTTAAATAGGTGTT  
GCCATCTTTCAACATATGTCGCTCCACAAAATAGAGAACAGAACAGAAAAAGAACAGGA  
GGAAGAGGAGCGAAGCGCGTGAAGAGGAAGAACAGTCTGCAAAAGGAGGAAGAACGTTAGG  
AGAGAAGAAGAGGAAAGGCTTCGACGGAGGAAGAGGAAGGAGACGGATAGAACAGAACAGGCTTCG  
TGGAGCAGCAAAGCAGCAGATAATGCCAGCTTAAACTCCAGACTGCCGTGAGTTCCAGCAGTATGC  
AGCCAAACAGTATCCAGGAACATGAAACAGCAGCAAATTCTCATGCCAGTTGCAAGAACACTAT  
CAGCAGTACATGCCAGCTGATCAAGTCCAGCTGCCACAGCAACAGGAGCATTACAGAACACAGG  
AAAGTAGTAGTGGCTGGGCTTCCCTGCCATCATCAAAAGTGAATGCAACTGTAACAGTAATATGAT  
GTCACTTAATGGACAGGCCAAACACACTGACGCTCCGAAAAGAACATGGAAACAGCTGCA  
GAAGCCCTGGGAATGGACAGGAAAGAACATCTTCCAGTAATGCACTGCCATCCATGTCAGGG  
AGATCAAAGACTCAAAGAGAACATTGACGAGGATCATATCTCTTGGGAATTGCCACAGAACATTAT  
GACATTGGTTGGGTGATTTGAATGGACAGACTCTCAAACACTGCTGTCAGCGTGCATGTCAGTG  
AGTCCAGCGATGACGACGAGGAGGAAGAACATCGGTTGTGAAGAGAACAGCAAAGAACATGCCAA  
CAAGCCTTGGATGAGATTGCTGCTGTGACGGACTGTCAGGAGGTGATGCTGGCAG  
CATCAATATCCAGGGAGAGGAGTCTATCTCTCAAGTTGACAACCTCTACTCTTGCTGGCGGTCAA  
CAGTCTACTACAGAGTCTATTATACTAGATAAAATGTTGTTACAAAGTCTGGAGTCTAGGGTTGGCAG  
AAGATGACATTAAATTGAAATTCTTTACTTTGTGGAGCATTAGAGTCACAGTCTTACCTTATTGA  
TATTGGCTGATGGTTGTGAACTCTGCTGGGAATCAAATTTCTTGTGAGACTCTGCTGTCAG  
TTGGGGTTAAAGGAGATTCTCAGACTCATCCAGCCCTGGGTGCTGACAGGAGTCACTAGTGGATG  
CTGAAGTACATGAGCTACATGTTAAATATTAAAGTCTCCAAAATAAAACACCCCCAACGTTGACCTTAC  
CCGGCTGATGGTTAGGCCCTGCTGCCCTGCTCATGTCATGAGACGCCGTAGTTACAGTGTCT  
AATTGAAATTCCATAAGTAAACAGTCTATATCAGGTGCATCTGGCTTGTGATTAAAGGCCATT  
CTTAAACACTAACACCTCACAGATTATAATAGAAAAGAACATGGCCTCAGTTGATCTCGTTCAGAATG  
ACCCAGATTGTTCTGCTTGGGTGCACTGTTAGTTGAGACTTACAGAGAACATTATTCTGAG  
ATAATCTTAAACTAGAATGTCAAAACAACTAATTGATAATTGAAAGTATCAAGATAACGTTAGAACAC  
ATTTTCTCAGGAACCTCCACAAACATTGAACTCTGTTGATCTTATTGGTATTCTACTACTAGTGC  
AAAATACAGGTTTTGTTGTTGGCTCATAGAGTATCTCAAATTGAAACTTTCTGCACA  
AAGAATAAAATTAAAGGATTATAACTCAAATTGGCACCTACTGAAATTAAACACATAAAATCATTAA  
ATATAATTGAGCATAATGGGAAGTAAACATTGCACTAATATGAAATCACTGCCAGAGAACAGTCT  
TTTAATTGTTACTACTAGTCACAAACCCACATTATTCCAGTTGGAAATTACTTATTAAAGGAGAATTG  
GAAATACATATGCCCATGCTTAAATTGTTAGCTTAAATTGTTGTTATTCTTATTGACGGGAAGAGGT  
ACATCTTTCTCCTACTGAAAACCAAATATGAGTTATTGCTCAAATTGTTGATAAAGTGA  
GTGATTCTGTTGAGGAGAGTGGTATAGATAGAAATGACAAAGATGGCAATACACTTAAT

Figure 36 part - 33

GTGTTATTGTATGTTACTGAAGTACTTAGATTTAAAATTCAAACTCAAATCAGTCTTGAG  
GAGGGTTTCATTAACTCAGTATATACTACAGTTCACTACATATGGTTGTTGAGTTTTGTGTGCTGTA  
TTCTTCTGTTTTAATACCTGGTTTGTACATATCTAACACTCTGTTCTCTTGTGTTGTTGAGAAAC  
TGGATTTTTCTTAAGCAGTGTTAATTGTGTTTTAATTTGATTGAGAAGTAGTCCCAGC  
TCATAGGTGTCATAACTGTTACATCCAGAACATTGTCAGGCTCTGTCAGCTTTCATGTACATATG  
GTATAGAAACCAGGGAGTTAGGCACCTCCCTGGAATTTTTATGAGAAAAAAATACTGTATTAAAAA  
TGTAATTAACCTTTAAAAGCAGGCACTAATATATTTCTTCCAGCCTTGAGTACAAATTGTCCT  
TGCACATGTTAAGATGAATTATCTCTAAAATATCATTGTTCTGGGAGCAGTGTATGTTACTTACAT  
AGCAGCGGTTCTGTCATGTGTTACAGGAGAAATTGGTTTAAACTTCTATTGCTTGGC  
TGTTGATTAGTACAGTACAAGTGGCATTCAGGAGATCTGAAAGTAATATATTAACTTAA  
GTTTATCTGAAAAAAAAAAAAAA

Human GOCAP1 mRNA sequence - var3 (public gi: 15799258) (SEQ ID NO: 63)  
GGAAGTCGATACGTGGCTGCCCTCTGCCCCGCTGAGGAGGTGAGCAGCCGGAGATGGCGCGGTGCTG  
AACCGAGAGCGACTCGAGGTGTCGCGTCAGGCCCTACGCTCAGCCGGACCCGGAGGAGCGGCCCTGGG  
CGGAGGGCGCCCGCTGCTGCCGCCACCGCTGCCACCGCCCTCGCCACCTGGATCCGGTCGCGGCCCGGG  
CGCCTCAGGGGAGCAGCCCGAGCCCGGGAGGCGGGCTGGGGCGCGCGGAGGAGGCGCGGCCGCTG  
GAGCAGCGCTGGGTTTCGCGCTGGAGGAGTTGTAACGGCTCGCACTGCCTTCTCAAAGAAAAGATG  
GCAAAGCATTTACATCCAACCTATGAAGAAAATTGAAGCTTGTGCACTGCATAAGCAAGTCTTATGGG  
CCCATATAATCCAGACACTGTCTGAGGTTGGATTCTTGATGTGTTGGGAATGACAGGAGGAGAGAA  
TGGGCAGCCCTGGAAACATGTCTAAAGAGGATGCCATGGTGGAGTTGTCAAGCTCTTAAATAGGTGTT  
GCCATCTCTTCAACATATGTTGCGTCCCACAAATAGAGAAGGAAGAGCAAGAAAAAAAGGAAGGA  
GGAAGAGGAGCGAAGGCGCGTGAAGAGGAAGAAGAGAACGCTCTGCAAAAGGAGGAAGAGAACGCTAGG  
AGAGAAGAAGAGGAAAGGCTTCGACGGGAGGAAGAGGAAAGAGGAAAGGAGACGGATAGAAGAAGAAGGCTCGGT  
TGGAGCAGCAAAGCAGCAGATAATGGCAGCTTAAACTCCAGACTGCCGTGCAAGTCCAGCAGTATGC  
AGCCCAACAGTATCCAGGAAACTACGAACAGCAGCAAATTCTCATCCGCAGTGTGCAAGGAGCAACACTAT  
CAGCAGTACATGGCAGTGTATCAAGTCCAGCTGCAAGCACAGGAGCATTACAGAAACACAGG  
AAGTAGTAGTGGCTGGGTCTCTTGCCTACATCATCAAAGTGAATGCAACTGTACCAAGTAATATGAT  
GTCAGTTAATGGACAGGCCAAACACACACTGACAGCTCCGAAAAGAACACTGGAACCCAGAAGCTGCA  
GAAGCCCTGGAGAATGGACCAAAAGAATCTCTTCAGTAATAGCAGCTCCATGGACACGACCTC  
AGATCAAAGACTCAAAGAGAAGATTAGCAGGATGCAAGTCCGTGATTACAGTGGCGAGGAGAAGT  
GGTCACTGTTGAGTACCCACCCATGAAGAAGGATCATATCTCTTGGAAATTGCCACAGACAATTAT  
GACATTGGGTTGGGTGATTGGATGGACAGACTCTCAAACACTGCTGTCAGCGTGCATGTCAGTG  
AGTCCAGCGATGACGACGAGGAGGAAGAGAAACATCGGTTGTGAAGAGAAGGCAAAAGGCAA  
CAAGCCTTGTGGATGAGATTGTGCTGTGACCGACGGGACTGTGATAGGAGGAGGTGATGCTGGCAGC  
CATCAAATATCCAGGGAGAGGAGTCTATCTCTCAAAGTTGACAACCTCTACTCTTGTCAGGTTGGCAG  
CAGTCTACTACAGACTCTATTAACTAGATAAAATGTTCTTACTGAGGAAAGAACACTCTACTCTTG  
AAGATGACATTAAATTGGAAATTCTCTTACTGAGGAAAGAACACTCTGAGGAGGAGGAGGAGGAGT  
TATTGGTCTGATGGTTGTGAACTCTGCTGGGAACTCAAATTCTCTGAGACTCTTAGCATTCAACT  
TTGGGTTAAAGGAGATTCTCAGACTCATCCAGCCCTGGGTGCTGACCAGCAGAGTCACTAGTGGATG  
CTGAAGTTACATGAGCTACATGTTAAATATTTAAAGTCTCAAATAAAACACCCAAACGTTGACCTTAC  
CCGGCTGATGGTTAGCCCTTGCTGCTGCCATGTGCTTATGAGAGGCCGTAGTTACAGTGTCCCTCT  
AATTGAAATCCATAAGTTAACAGTCTATATCAGGTGCACTGGCTTGTAAAGGCAATTTTAA  
CTTAAAAACTCAAACACCTCACAGATTATAATAGAAAAGAAATGCCCTAGTTGATCTGTTCAAGATG  
ACCCAGATTGTTCTGTTGGTGCACTGTTAGTTCAAGGTTATTTACAGAGAATTATTTCTGAG  
ATAATCTTAAACTAGAATGTTCAAACACTATTGATAATTGAAGTATCAAGATACTGAGAACACCTCAGAG  
ATTTTCTTCAGGAACCTCCACAAACTTTGAATCTCTGTTATCTTATTGTTGATCTACTACTAGTAGC  
AAAATACAGGTTTTGTTGTTGGCTCATAGAGTATCTCAAATTGAAACTTTCTGACA  
AAGAATAAAATTAAAGGATTATAAAACTCAAATGGCACCTACTGAGATTAAAGGAGAATTATTTCTGAG  
ATATAATTCAACATGGGAGTAACATTGCACTAATATGGAAATCACTGCCAGAGACAGTCTATTCT  
TTAATTGTTACTCTGAGTCAACACCCACATTATTCACTGTTGAAATTACTTATTAAAGGAGAATTG  
GAAATACATATGCCATGTTAAATTGTTAGCTTAAATTGTGTTATTCTTATTGACGGGAAGAGGT  
ACATCTTTCTGTTTTTAATACCTGGTTTGTACATATCTAAGTCTCTCTTGGTCTCAGAAC  
GTGATTCTGTTTCAGGAAGGGAGAGTGGTATAGATAGAAAATGACAAAGATGGCAATATACACTTAAT  
GTTGTTATTGTTACTGAGACTCTAGATTGTTAAATTCAATCTAAATCAGTCTTGTGCTG  
GAGGGTTTCTTAAGTCAACTGAGTATACAGTTCACTACATATGGTTGTTGAGTTTTGTGCTG  
TTCTTCTGTTTTTAATACCTGGTTTGTACATATCTAAGTCTCTCTTGGTCTCAGAAC  
TGGATTTTTCTTAAGTCAACTGCTTAATTGTGTTTTTAATTGTTGATTGAGCTTCTGAG  
TCATAGGTGTCATAACTGTTACATCCAGAACATTGTCAGGCTCTGTCAGCTTTCATGTACATATG  
GTATAGAAACCATGGAGTTAGGCACTCCCTGGAATTTTTTTATGAGAAAAAAATACTGTATTAAAAA  
TGTAATTAACCTTTAAAAGCAGGCACTAATATATTTCTTCCAGCCTTGAGTACAAATTGTCCT  
TGCACATGTTAAGATGAATTCTCTAAATATCATTGTTCTGGGAGCAGTGTATGTTACTTACAT  
AGCAGCGGTTCTGTCATGTGTTCAAGAAATTGGTTAAACTTCTTATTGCTTGGC

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TGTTGATTAGTACAGTACAAGTGGCATTCAAAAAGATCTTGAAGTAATATATTAATCAATTAAAAT  
GTTTATCTGTAAAAAAAAAAAAAA

Human GOCAP1 mRNA sequence - var4 (public gi: 21961496) (SEQ ID NO: 64)  
CGGACCGCGGGTGCATCTCTTTCAACATATGTTGCGTCCACAAAATAGAGAAGGAAGAGCAAGAAA  
AAAAAAGGAAGGAGGAAGAGGAGCGAAGGCGCGTGAAGAGGAAGAAAAGAGAACGCTGCAAAGGAGGA  
AGAGAAACAGTAGGAGAGAAGAGGAAAGGCTCGACGGGAGGAAGAGGAAGGGAGACGGATAGAAGAA  
GAAAGGCTTCGGTTGGAGCAGCAAACAGCAGATAATGGCAGCTTTAACTCCCAGACTGCCGTGCAGT  
TCCAGCAGTATGCAGCCAACAGTATCCAGGGAACTACGAACAGCAGCAAATTCTCATCCGCCAGTGCA  
GGAGCAACACTATCAGCAGTACATGCAGCAGTTGATCAAGTCCAGCTTGACAGCACAGGAGCAITA  
CAGAAACAACAGGAAGTAGTAGTGGCTGGGTCTCCCTGCCTACATCATCAAAGTGAATGCAACTGTAC  
CAAGTAATATGATGTCAGTTAATGGACAGGCCAAACACACACTGAGCAGCTCCGAAAGAAACTGGAACC  
AGAAGCTGAGAAGAAGCCCTGGAGAATGGACCAAAGAATCTCTCCAGTAATAGCAGCTCCATCCATG  
TGGACAGCACCTCAGATCAAAGACTCTAAAGAGAAGATTCAAGGAGATTCAGCAGGATGAGATTCCGTGATTACAGTGG  
GCCAGGGAGAAGTGGTCACTGTTGAGTACCCACCCATGAAGAAGGATCATATCTCTTGGGAATTTC  
CACAGACAATTATGACATTGGGTTGGGTGTATTGATGGACAGACTCTCCAAACACTGCTGTCAGC  
GTGCATGTCAGTGAGTCCAGCGATGACGACGAGGGAGAAGAGAAAACATCGGTTGTGAAGAGAAGCCA  
AAAAGAATGCCAACAGCCTTGTGATGAGATTGCGCTGTGACCGACGGACTGTATGAGGAGGT  
GTATGCTGGCAGCCATCAATATCAGGGAGAGGAGTCTATCTCTCAAGTTGACAACCTCTACTCTTG  
TGGCGTCAAATCAGTCTACTACAGAGTCTATTATACTAGATAAAATGTTGTTACAAAGTCTGGAGTC  
TAGGGTTGGCAGAAGATGACATTTAATTGAAATTCTTACTTTGTGGAGCATTAGAGTCACAG  
TTTACCTTATTGATATTGGTCTGATGTTGTGAACTCTTGCTGGGAATCAAATTCTTGAGACTCTT  
TAGCATTCAACTTGGGTTAAAGGAGATTCCCTCAGACTCATCCAGCCCTGGGTGACCCAGCAGAG  
TCACTAGTGGATGCTGAAGTACATGAGCTACATGTTAAATTTAAAGTCTCCAAAATAAACACCCCA  
ACGTTGACCTTACCGGCTGATGGTAGCCCTGCTGCTGCTGCTCATGTTGCTTATGAGAGCCGTAGT  
TACAGTGTCTCTAATTGAAATCCATAAGTTAAACAGTCTATCAGGTGAGCTGGCTTGTAAAG  
GCCATTAAACTAAACACTAACACCTCAGATTATAATAGAAAAGAAATGGCCTCAGTTGAT  
CTCGTTCAGAATGACCCAGATTGTTCTGCTTGGGTGAGCTGTTAGTTCAAGGTTATATTACAGAGA  
ATTATTTCTGAGATAATCTTAAACTAGAATGTCAAAACTAATTGATAATTGAAGTATCAAGATACTGTA  
GAACACCTCAGAGATTCTTCAGGAACCTTCCACAAACTTGAATCCTGTATCTTATTGGTATTCA  
TACTACTAGCAGAAATACAGGTTTTGTTGTTGTTGTTGCTTGTAGAGTATCTCAA  
TTGAAACTTTCTGCACAAAGAATAAAATTAGGATTTATAAACTCAAATTGGCACCTACTGAAATTAA  
ATACATAAAATCATTAAATATAATTCAGCATATGGGAAGTAACATTGCACTAATATGAAATCACTGCC  
AGAGACAGTCTATTCTTCTTAAATTGTTACTACTTAGTCACAAACCCACATTATCCAGTTGGAATT  
ACTTATTAAGGAGAATTGAAATACATATGCCATGCTTAAATTGTTAGCTTAAATTGTTGTTATTCT  
TTATTGACGGGAAGAGGTACATCTTTCTACTGAAAACAATATGGATAATTGCTCAAATTG  
TATAAGTGTGGCTAGTGTATTCTGTTTCAAGAAGGGAGAGTGGTATAGATAAAATGACAAGAGATGG  
CAATATACACTTAATGTTGTTATTGTTACTGAGACTTGTAGACTTGTAGTTAAATTCAATCCTA  
AATCACTCTTGTAGGAGGGTTCTTAACACTGAGTATATACAGTCTACTACATATGGTTGTTGAGT  
TTTTGTTGCTGTATTCTTCTGTTTAATACCTGTTGTTGACATATCTAATCTGTTCTCTTT  
GGTGTGCTGAGAAACTGGATTTTTTCTTAAGCAGTGTAAATTGTTGTTTAATTGATTCA  
AAGTAGTCCAGCTCATAGGTGTTCAACTGTTACATCCAGAACATTGTCAGGCTCTGTGAGCTTC  
ATGTCACATATGGTATAGAAACCATGGAGTTAGGCACCTCCCTGGATTTTTTATGAGAAAAACTGT  
ATTAAAATGAAATAAAACTTTAAAGCAGGCACTAATATATATTCTTCCAGCCTTGATTACAAA  
TTTGTCTTGACATGTTAAGATGAATTCTCTAAATATCAATTGTTCTGGGAGCAGTGTATGTTA  
CTTACATAGCAGCGGTTCTGTCATGTGTTCAAGTATTGTTAAACTTCTTATTGCC  
TTGGCTGTTGATTAGTACAGTACAAGTGCAGTTCAAAAGATCTTGAAGTAATATTTAAATCAATT  
AAAATGTTATCTGTAAAAAAAAAAAAAA

Human GOCAP1 mRNA sequence - var5 (public gi: 24496472) (SEQ ID NO: 65)  
CCGCTGAGGAGGTGAGCAGCCGGAGATGGCGGGGTGCTGAACGAGAGCGACTCGAGGTGTCGTCGA  
CGGCCTACGCTCAGCCCCGACCCGGAGGAGCGGCCCTGGGGCGAGGGCGCCCGCTGCTGCCACCG  
CTGCCACGCCCTGCCACCTGGATCCGGTGCAGGGCCGGGGCGCTCAGGGAGGAGCAGCCCGAGCCCGGGG  
AGGCGGGGGCTGGGGCGGGGGAGGAGGCGGGGGCTGGAGCAGCGCTGGGGTTTCGGCTGGAGGA  
GTGTCAGGCTGTGCACTGCGCTCTCAAAAGAAAAAGATGGCAAGCATTTCATCCAACCTTATGAAAGAA  
AAATTGAAGCTTGTCAGTCAAGCAAGTTCTTATGGCCCATATAATCCAGACACTTGTCTGAGG  
TTGGATTCTTGTGTTGGGAATGACAGGAGAGAATGGCAGCCCTGGGAAACATGTCTAAAGA  
GGATGCCATGGTAGTTGTCAGGTCTTAAATAGGTGTTGCCATCTTTCAACATATGTTGCGTCC  
CACAAAATAGAGAAGGAAGAGCAAGACAAAAAGAAGGAGGAAGAGGAGGAGCAGCGAAGGCGGTGAAGAGG  
AAGAAAGAGAGCGTCTGCAAAAGGAGGAAGAGAAACGTTAGGAGAGAAGAGGAAAGGCTCGACGGGA  
GGAAGAGGAAGGAGACGGATAGAAGAAGAAAGGCTTGGAGCAGCAAAGCAGCAGATAATGGCA  
GCTTAAACTCCAGACTGCCGTGCAAGTCCAGCAGTATGCAGCCAAACGGTATCCAGGGAACTACGAAC

Figure 36 part - 35

AGCAGCAAATTCTCATCCGCCAGTGCAGGAGCAACACTATCAGCAGTACATGCAGCAGTTGTATCAAGT  
CCAGCTTGACAGCAACAGCAGCATACAGAAACAACAGGAAGTAGTAGTGGCTGGCTTCCTGCCT  
ACATCATCAAAAGTGAATGCACTGTACCAAGTAATATGATGCCAGTTAATGGACAGGCCAAACACACA  
CTGACAGCTCGAAAAAGAAGTGGAACCCAGAAGCTGCAGAAGAAGGCCCTGGAGAATGGACCAAAAGAATC  
TCTTCCAGTAATAGCAGCTCATCCATGTGGACACGACCTCAGATCAAAGACTTCAAAGAGAACATTCA  
GCAGGATGCAGATTCCGTGATTACAGTGGCCGAGGAGAAGTGGTCACTGGTCAGTACCCCACCCATGAAG  
AAGGATCATATCTTTTGGAAATTGCCACAGACAATTGTGACATTGGGTTGGGGTGTATTTGAATG  
GACAGACTCTCAAACACTGCTGTCACTGCATGTCACTGAGTCCAGCGATGACGACAGGAGGAGAAGAA  
GAAAACATCGGTGTGAAGAGAAGCAGAAAGAATGCCAACAAGCCCTTGTGGATGAGATTGTGCGCTG  
TGTACCGACGGGACTGTCACTGAGGAGGTGTATGTCGGCAGCCATCAAATATCCAGGGAGAGGAGTCTATCT  
CCTCAAGTTGACAACCTCTACTCTTGTGGCGTCAGGTTGGGAGAAGATGACATTTAATTGAAATTCTT  
TAAAATGTTGTTCAAAGACTGAGTCACTACAGTTTACCTTATTGATATTGGTCTGATGGTTGTGAACCTCTGC  
TTACTTTGTGGAGCATTAGAGTCACAGTTTACCTTATTGATATTGGTCTGATGGTTGTGAACCTCTGC  
TGGGAAATCAAATTCTTGTGAGACTCTTACGATTCATACTTTGGGTTAAAGGAGATTCTCAGACTCA  
TCCAGCCCTGGGTGCTGACAGCAGAGTCACTAGGGGATGCTGAAGTTACATGAGCTACATGTTAAATA  
TTAAAGTCTCAAACACCCCCAACGTTGACCTTACCCGGCTGATGGTTAGGCCCTTGTGCGCTG  
CTCCATGTGTCTTATGAGAGCCGTAGTTACAGTGTCTCTAATTGAAATCCATAAGTTAACAGTCTA  
TATCAGGTGCAGCTGGCTTGTGATTAAGGCCATTAAAGGCAATTAAAGCTCAACACCTCACAGATTATA  
ATAGAAAAAGAAATGGCCTCAGCTTGATCTCGTCAGAATGACCCAGATTGTTCTGCCCTGGGTCAGC  
TGTGTTAGTTGAGGTTATATTACAGAGAATTATTCTGAGATAATCTAAACTAGAATGTTCAAACACTA  
ATTGATAATTGAAAGTATCAAGATACGTTAGAACACCTCAGAGATTGTTCTCAGGAACCTTCCACAAACTT  
GAATCTTGTATCTTATTGGTATTCTACTACTAGTAGAGGTTTACAGGTTTTGTTGTTGTTGTT  
TTGTTTGGCTCATAGAGTATCTCAAATTGAAACTTTCTGACAAAGGAAATTAAAGGATTTTATA  
AACTCGAATTGGCACCTACTGAAATTAAACATATAATTCTGACAAAGGAAATTAAAGGATTTTATA  
ACATTGCACTAATATGAAATCACTGCCAGAGACAGTCATTCTTAAATTGTTACTACTAGTCAC  
AACCCCCACATTATTCCAGTTGAAATTACTTAAAGGAGAATTGAAATACATGTGCCATGCTTAAAT  
TTTATAGCTTAAATTGTTATTCTTATTGACGGGAAGAGGTACATTTTTCTCTTACTGAAAAC  
AAATATGGATTAAATTGCTCAAATTGTTATAAAAGTGAATTGGTAGTGATCTTGTGTTCTGAGGGGAGAG  
TGGTATAGATAGAAAATGACGAAGATGGCAATATACTTAATGTTGTTATTGTTAGTGTGTTACTGAAGA  
CTTAGATTTTAAATTCCTAAATCCTAAATCCTTGTAGGGGGGTTTCAATTAACTGCACTATATAC  
AGTTCACTACATATGGGTTGTTGAGTTTTGTGTGTTGTTCTGTTCTGTTCTGTTCTGTTCTGTT  
TGTACATATCTAACTCTGTTCTTTGGTTGTTAGAGAACTGGATTTTCTCTCTTAAAGCAGTGCTTA  
ATTGTTGTTTTAAATTGTTGATTCAGAAGTACTCCCAGCTCATAGGCGTTCATACTGTTACATCCAGAAC  
ATTGTCAGGCTCTCTGTCAGCTTCTGTCATGTCATGTTAGGAAACCATGGAGTTAGGCACCTCCTGG  
TTTTTTTATGAGAAAATNCTGTTAAATTGAAATGAAACATGTTAAACTTAAAGGAGAATTGAAATACATG  
TTCTCTCAGCTTGTGATTACAAATTGTTGCTGACATGTTAAGATGAAATTATCTCTTAAATATCAT  
TGTCTTGGGAGCAGTGTATGTTACTTACATAGCAGGGTCTCTGTCATGTTGTCATGTCACGAATATT  
TTGGTTTAAACTTCTTATTGCTTGGCTGTTGATTAGTACAGTACAAGTGCATTCACAAAGATC  
TTGAAAGTAATATTTAATCAATTAAATGTTATCTGGAAAAAAAAAAAAAA  
AA

Human GOCAP1 mRNA sequence - var6 (public gi: 28374435) (SEQ ID NO: 66)  
TCCGTCCCCGCTGAGGAGGTGCAGCAGCGGGAGATGGCGGCGGTGCTGAACGCAGAGCAGCTCGAGGTGT  
CCGTCGACGGCCTCACGCTCAGCCCGAACCGGGAGGCCCTGGGGCGAGGGCGCCCGCTGCTGCC  
GCCACCGCTGCCACCCTCGCACCTGGATCCGGTCGCGCCCGGGCGCTCAGGGAGCAGCCCGAG  
CCCCGGGAGGCCGGCTGGGGCGCGCGGGAGGAGGCGCGGGCTGAGCAGCGCTGGGGTTTCTGGCC  
TGGAGGAGTTGACGCCCTGGCACTGCGCTTCTCAAAGAAAAGATGCAAAGCATTCTACATCCAACTTA  
TGAAGAAAATTGAAAGCTGTGGCACTGCAAAAGCAAGTTCTATGGCCCATATAATCCAGACACTTGT  
CCTGAGGTGGATTCTTGATGTTGGGAGTACAGGAGGAGAGAAATGGGAGCCCTGGGAAACATG  
CTAAAGAGGATGCCATGGGAGTTGTCAGCTTAAATAGGTTGCTCATCTTCAACATATGT  
TGGCTCCCACAAAAATTGAGAAGGAAGAGCAAGGAAAAGGAGGAGGAGGAGGAGGAGGAGGAGGAG  
GAAGAG  
GACGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG  
AATGGCAGCTTAAACTCCCAGACTGCGTGCAGTTCCAGCAGTATGCAAGCCAAACAGTATCCAGGGAA  
TACGAACAGCAGCAAATTCTCATCCGCCAGTTGCACTGAGGAGCAACACTATCAGCAGTACATGCA  
GAGTTGTCAGTACAGAAACACAGGAAGTGTAGTGGCTGGGTCTTC  
CTTGCCATACATCATCAAAGTGAATGCAACTGTACCAAGTAATATGATGTCAGTTAATGGACAGGCCAA  
ACACACACTGACAGCTCGAAAAAGAAGTGGAAACCGGAAGCTGCAGAAGAAGGCCCTGGAGAATGGACCA  
AAGAATCTCTCCAGTAATAGCAGCTCCATGTCAGCAGACGACCTCAGATCAAAGACTTCAAAGAGAA  
GATTCACTGAGGATGCAAGATTCCGTGATTACAGTGGGCCAGGAGAAGTGGTCACTGTTGAGTACCCACC  
CATGAAGAAGGATCATATCTCTTGGGAAATTGCCACAGACAATTATGACATTGGGTTGGGTGATT  
TTGAATGGACAGACTCTCCAAACACTGCTGTCAGCGTGCATGTCAGTGGAGTCCAGGAGCAGACGAG  
GGAAGAAGAAACATCGGTGTGAAGAGAAGCAGAAAGAATGCCAACAAGCCTTGTGCTGGATGAGATT

Figure 36 part - 36

GTGCCCTGTCACCGACGGACTGTCATGAGGAGGTATGCTGGCAGCCATCAATATCCAGGGAGAGGAG  
TCTATCTCCTCAAGTTGACAACCTCTACTCTTGCGGGTCAAATCAGTCTACTACAGACTCTATT  
TACTAGATAAAAATGTTGACAAAGTCTGGAGTCAGGGTTGGGCAGAAGATGACATTAAATTGGAAA  
TTTCTTTTACTTTGAGGACATTAGAGTCACAGTTACCTTATTGATATTGGCTGATGGTTGTGAA  
CTCTGCTGGGAATCAAATTCCTTGAGACTCTTAGCATTCACTTTGGGTTAAAGGAGATTCTC  
AGACTCATCCAGCCCTGGGTGCTGACCAGCAGAGTCACTAGTGGATGCTGAAGTTACATGAGCTACATG  
TTAAATATTAAAGTCTCCAAAATAAAACACCCCACGTTGACCTTACCCGCTGATGGTTAGCCCTTG  
CTGCCTGCTCCATGTGCTTATGAGAGGCCGAGTTACAGTGTGCTTAATTGAAATCCATAAGTTAAC  
AAGTCTATATCAGGTGCACTGGTTGATTAAAGGCCATTTTAAAACCTAAACACCTCAC  
GATTATAATAGAAAAAGAAATGGCTCAGTTGATCTGTCAGAATGACCCAGATTGTTCTGCTTGG  
GTGCAGCTGTTAGTCAGGTTACAGAATTATTTCAGATAATCTTAAACTAGAATGTT  
AAAACATAATTGATAATTGAGTATCAAGATACGTTAGAACACCTCAGAGATTTCAGGAACCTCCAC  
AAACTTGAATCTTGATCTTATTGGTATTCACTACTAGTAGCAGAAATACAGGTTTTGTTTG  
TTTGTGCTTGGCTTCAAGAGTATCTCAAATTGAAACTTTCTGCACAAAAGAATAAAATTAGGATT  
TAAACTCAAATTGCCACCTACTGAATTAAACATCAAATTATAATTCAAGCATATGGGAAG  
TAACATTGCACTAATATGAAATCACTGCCAGAGACAGTCATTTCATTGTTACTACTAGTC  
ACAAACCCCACATTATTCAGTTGAAATTACTTATTAGGAGAATTGAAATACATATGCCATGCTTA  
AATTATAGCTTAATTGTTATTCTTATTGACGGGAAGAGGTACATCTTTTCTTACTGAA  
AACAAATATGGATAATTGCTCAAATTGTTAGTGTAGTGTAGTGTATTGTTACTGAA  
AGTGGTATAGATAGAAAATGACAAGATGCCAATATAACACTTAATGTTATTGTTATTGTTACTGAA  
GTACTTAGATTTTAAATTCAAATCCTAAATCCTGTTGAGTTTGTGCTGTTATTCTTCTGTTTTAATACCTGG  
TACAGTCACTACATATGGTTGTTAGTTTGTGCTGTTATTCTTCTGTTTTAATACCTGG  
TTTGTACATATCTAATTGTTCTTCTGTTGTTAGTGTAGTGTAGTGTACTGAA  
TAATTGTTGTTTTAATTGTTAGTCAAGTAGTGTAGTGTAGTGTAGTGTAGTGTACTGAA  
ACATTGTCAGGCTCTGTCAGCTTCTGTCAGTACATATGGTATAGAACCCATGGAGTTAGGCACCTCCTG  
GATTTTTTTTTATGAGAAAATACTGTATTAAATGAAATAAACTTTAAAAGCAGGCACTAAT  
ATATTTCTTCCAGCCTTGATTACAAATTGCTCTGCACATGTTAGATGAAATTATCTCTAAAT  
ATCATTGTTCTGGAGCAGTGTATGTTACTTACATAGCAGCGGTTCTGTCATGTTCAAGTCA  
TATTGTTTAAACTTCTTATTGCTCTGGCTGTTAGTACAGTACAAGTGCATTTC  
GATCTGAAAGTAATATTTAATTGTTAGTCAAGCTTAAATTAGGTGTTGCACTCTTTCAACATATGTTGCGTCCC  
GATGCCATGGTGGAGTTGTCAGCTTAAATTAGGTGTTGCACTCTTTCAACATATGTTGCGTCCC  
ACAAAATAGAGAAGGAAGAGCAAGAAAAAAAGAAGGAGGAAGAGGAGGAAGAGGAGCGAAGGCGGCGTGAAGAGG  
AAGAAAGAGAAAGTCTGCAAAAGGAGGAAGAGAAACGTTAGGAGAGAAGAGGAAAGGCTCGACGGGA  
GGAAGAGGAAGGAGACGGATAGAAGAAAGGCTTCGGTTGGAGCAGCAAAGCAGCAGATAATGGCA  
GCTTTAAACTCCAGACTGCCGTGCAAGTCCAGCAGTATGCCAACAGTATCCAGGGAAACTACGAAC  
AGCAGCAAATTCTCATCCGCAAGTGCAGGAGCAACACTATCAGCAGTACATGCCAGCTGATCAAGT  
CCAGCTTGCACAGCAACAGGCAAGCATTACAGAAACACAGGAAGTAGTGTGCTGGTCTTCCCTGCT  
ACATCATCAAAGTGAATGCAACTGTACCAAGTAATATGATGTCAGTTAATGGACAGGCCAAACACACA  
CTGACAGCTCGAAAAGAACCTGAAACCGAAGCTGCAAGAAGGCCCTGGAGAATGGACCAAAAGAAC  
TCTTCCAGTAATGCACTCCATCCATGTCAGGACACGACCTCAGATCAAAGACTTCAAACAGAGAAGATTCAAG  
CAGGATGCAAGTCCGTGATTACAGTGGCGAGGAGAAGTGGTCACTGTTGAGTACCCACCCATGAAG  
AAGGATCATATCTTTGGAAATTGCCACAGACAATTATGACATTGGTTGGGTGATTGTAATG  
GACAGACTCTCAAACACTGCTGTCAGCGTGCAGTCAGTGTGAGTCCAGCGATGACGAGGAGGAAGAA  
GAAAACATCGTTGTAAGAGAAGCCAAGAATGCCAACAGCCTTGTGGATGAGATTGTC  
TGTCAGGACGGACTGTCATGAGGAGGTGATGCTGGCAGCCATCAATATCCAGGGAGAGGAGTCTATCT  
CCTCAAGTTGACAACCTCTACTCTTGCGGGTCAAATCAGTCTACTACAGACTTATTATACTAGA  
TAAAATGTTGTTACAAAGTCTGGAGTCAGGGTTGGGCAGAAGATGACATTAAATTGAAATTCTT  
TTACTTTGTTGAGCATTAGAGTCACAGTTACCTTATTGATATTGGCTGATGGTTGTGAACTCTTGC  
TGGGAATCAAATTCCCTGAGACTCTTAGCATTCACTTTGGGTTAAAGGAGATTCCCTCAGACTCA  
TCCAGCCCTGGGTGCTGACCAGCAGAGTCACTAGTGGATGCTGAAAGTTACATGAGCTACATGTTAAATA  
TTAAAGTCTCAAATAAAACACCCCAACGTTGACCTTAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAA

Figure 36 part - 37

Human GOCAP1 mRNA sequence - var8 (public gi: 2738926) (SEQ ID NO: 68)  
GAATTCCGGTGTGCGAGCCGTAGTTACAGTGTCTAATTGAAATCCATAAGTTACCAAGTCTA  
TATCAGGTACAGCTGGCTTCATAAAGGCCATTAAACTCAAAAACCTCACAGATTAT  
AATGAAAAAGAAATGGCCTCAGTTGATCTGTTCAAGATGACCCAGATTGTTCTGCTTGGGTGCA  
GCTGTTAGTTCAAGAGTTACAGAGAATTCTGAGAACTCTAAACTAGAATGTTCAAAC  
TAATTGATAATTGAGTACAGATACTGAGAACACCTCAGAGATTCTCAGGAACCTCCACAAAC  
TTTACAATCTGTATCTTATTGGTATTCTACTACTAGTCGAAAATACAGGTTTTGTT  
TGTTTGTGTTGGCTCATAGAGTATCTCAAATTGAAACTTCTGCCAAAGAATAAAATTAGGATT  
TATAAAACTCAAATTGGCACCTACTGAATTAAACATAAAAATGCAATTAAATTCAAGCATATGGC  
AGTAACATTGCACTAATGGAAATCACTGCCAGAGACAGTCTATTCTTAAATTGTTACTACTTAG  
TCACAACCCCACATTATTCCAGTTGAATTACTTATTAGGAGAATTGAAATACATATGCCATGCTT  
AAATTATAGCTTAATTGTGTTATTCTTATTGACGGGAAGAGGTACATCTTTCTTACTCA  
AAACAAATATGGATTAATTGCCTCAAATTGTATAAGTATTGGTAGTGATTCTGTTTCAAGAGGAG  
AGTGGTATAGATAGAAATGACAAAGATGGCAATATACACTTAATGTTGTTATTGTATGTTACTGAA  
GTACTTAGATTAAATTCAAATCCTAAATCATTCTGTAGGAGGGTTTCTTAACGTGAGATAT  
ACAGTTCACTACATATGGTTGTTGAGTTTGTGCTGTTCTTCTGTTTTAATACCTGGT  
TTGTCATATCTAATCTGTTCTTGTGTTGAGAAACTGGATTTTTTCTTAAGCAGTGCT  
TAATTGTGTTTAAATTGTTGAGTCAAGTAGTCCCAGCTCATAGGTGTTCACTGTTACATCCAGA  
ACATTGTCAGGCTCTGTCAAGCTTCACTGAGTATAGAAACCATGGAGTTAGGCACTCCCTG  
GATTTTTTTTATGAGAAAATACTGTATTAAATGAAACTTTAAAGC

Human GOCAP1 Protein sequence - var1 (public gi: 24496473) (SEQ ID NO: 240)  
MAAVLNAERLEVSVDGLTLSPDPEERPGAEGAPLLPPPLPPSPPGSGRGPGASGEQPEPGEAAAGGAAE  
EARRLEQRWGFGLGLEELYGLALRLFKEKDGFKAHPTYEEKLKLVALHKVQLMGPYNPDTCPEVGFFDVGN  
DRRREWAALGNMSKEDAMVEFVKLLNRCCHLFSTYVASHKIEKEEQDKKRKEEEERRRREEERERLQKE  
EEKRRREEEERLRREEERIRIEEERLRLQQKQIMAALNSQTAQFQOYAAQYPGNYEQQQILIRQL  
QEQQYQYMQQLYQVQLAQQAALQKQQEVVVAGSSLPTSSKVNVATVPSNMMSPNGQAKTHDSSEKELE  
PEAAEEALENGPKESLPVIAAPSMWTRPQIKDFQREDASGRFRDYSRGGEVVTVRVPTHEEGSYLFWEF  
ATDNCDIGFGVYFEWTDSPNTAVSVHVSSESSDDDEEEENIGCEEKAKKNANKPLLDEIVPVYRRDCHEE  
VYAGSHQYPGRGVYLLKFDNSYSLWRSKSVYYRVYYTR

Human GOCAP1 Protein sequence - var2 (public gi: 21961497) (SEQ ID NO: 241)  
RTRGCHLFSTYVASHKIEKEEQEKKRKEEEERRRREEERERLQKEEKKRKEEEERRRREEERERLQKE  
ERLRLEQQKQIMAALNSQTAQFQOYAAQYPGNYEQQQILIRQLQEQQYQYMQQLYQVQLAQQAAL  
QKQQEVVVAGSSLPTSSKVNVATVPSNMMSPNGQAKTHDSSEKELEPEAAEEALENGPKESLPVIAAPSM  
WTRPQIKDFKEKIQQDADSVITVGRGEVVTVRVPTHEEGSYLFWEFATDNYDIGFGVYFEWTDSPNTAVS  
VHVSESSDDDEEEENIGCEEKAKKNANKPLLDEIVPVYRRDCHEEVYAGSHQYPGRGVYLLKFDNSYSL  
WRSKSVYYRVYYTR

Human GOCAP1 Protein sequence - var3 (public gi: 15799259) (SEQ ID NO: 242)  
MAAVLNAERLEVSVDGLTLSPDPEERPGAEGAPLLPPPLPPSPPGSGRGPGASGEQPEPGEAAAGGAAE  
EARRLEQRWGFGLGLEELYGLALRLFKEKDGFKAHPTYEEKLKLVALHKVQLMGPYNPDTCPEVGFFDVGN  
DRRREWAALGNMSKEDAMVEFVKLLNRCCHLFSTYVASHKIEKEEQEKKRKEEEERRRREEERERLQKE  
EEKRRREEEERLRREEERIRIEEERLRLQQKQIMAALNSQTAQFQOYAAQYPGNYEQQQILIRQL  
QEQQYQYMQQLYQVQLAQQAALQKQQEVVVAGSSLPTSSKVNVATVPSNMMSPNGQAKTHDSSEKELE  
PEAAEEALENGPKESLPVIAAPSMWTRPQIKDFKKEKIQQDADSVITVGRGEVVTVRVPTHEEGSYLFWEF  
ATDNYDIGFGVYFEWTDSPNTAVSVHVSSESSDDDEEEENIGCEEKAKKNANKPLLDEIVPVYRRDCHEE  
VYAGSHQYPGRGVYLLKFDNSYSLWRSKSVYYRVYYTR

Human GOCAP1 Protein sequence - var4 (public gi: 10438061) (SEQ ID NO: 243)  
MAAVLNAERLEVSVDGLTLSPDPEERPGAEGAPLLPPPLPPSPPGSGRGPGASGEQPEPGEAAAGGAAE  
EARRLEQRWGFGLGLEELYGLALRLFKEKDGFKAHPTYEEKLKLVALHKVQLMGPYNPDTCPEVGFFDVGN  
DRRREWAALGNMSKEDAMVEFVKLLNRCCHLFSTYVASHKIEKEEQDKKRKEEEERRRREEERERLQKE  
EEKRRREEEERLRREEERIRIEEERLRLQQKQIMAALNSQTAQFQOYAAQYPGNYEQQQILIRQL  
QEQQYQYMQQLYQVQLAQQAALQKQQEVVVAGSSLPTSSKVNVATVPSNMMSPNGQAKTHDSSEKELE  
PEAAEEALENGPKESLPVIAAPSMWTRPQIKDFKKEKIQQDADSVITVGRGEVVTVRVPTHEEGSYLFWEF  
ATDNYDIGFGVYFEWTDSPNTAVSVHVSSESSDDDEEEENIGCEEKAKKNANKPLLDEIVPVYRRDCHEE  
VYAGSHQYPGRGVYLLKFDNSYSLWRSKSVYYRVYYTR

Unigene Name: GOSR2 Unigene ID: Hs.432552

Human GOSR2 mRNA sequence - var1 (public gi: 2316087) (SEQ ID NO: 69)  
ATGGATCCCCTGTCAGCAAACGACAAGCAGGTCCACGAGATCCAGTCAGTCATGGACGCCCTGGAGA  
CGGCAGACAAGCAGTCAGCACATAGTAGAAAACGAAATCCAAGCAAGCATAGACCAGATACTCAGCCG  
TCTAGAACGTCAGGAGATTTCAGCAAGGAGCCCCCTAACAAAAGGAAAATGCCAGACTTCGGGTT  
GACCAGTTAAAGTATGATGTCAGCACCTGCAGACTCGCAGTCAGAAACTCCAGCATCGGCCATGCAA  
GGGAGCAGCAGGAGAGACAGCGAGAAGAGCTCTGTGTCAGTCAGTTCAACAGGCTCTGACACCAC  
CATACCAATGGACGAATCAGTCAGTTAACCTCCCTCCAGAAAAGTTCAACAGGCAATGGATGACCTC  
ATTAGATGGCACAATATTTAGTGGACTGAGGAGCCAGAGACTGACCTTGAAGGGACTCAGAAGA  
AGATCCCTGACATTGCCAACATGCTGGCTTGCAACACAGTGTGCGCTCATGGAGAAGCAGGGCTT  
CCAGGACAAGTACTTATGATAGGTGGATGCTGACCTGTGTTGATGTTCTCGTGGTCAAGTGTGAGTAC

Human GOSR2 mRNA sequence - var2 (public gi: 3483524) (SEQ ID NO: 70)  
TTTTTTTTTCAAGGACAGATTGGCCTTATACTAAATCCACAATATACTGGTATTAGTACAGCCTGAA  
TCCGGGGCTGGTCACAGAAGGAAAAGGTTGAGTCCCTGAAAACAGAGTGTACAAGGACATACACACT  
ACAGATGTCACGGTGGATCTGCCACACTGGCTGGCAAAATGAGGGCCTGGCTGGCAGGTGCTAA  
TATATTCAGGAAGAGAAGGAAACAAAGAATTAGAGATACTAAACTAGAGCTGAGACTGTAAATTGGA  
AAATCACAAATCTTGCTACAGCTACTTCTAAGGGCAAGGCCACAAAGCCTGGCGCAGGTGCCA  
AGCCACAGTCTCTGAACCTTAAAGCCAACCACTCTATTAAACAACAGGAAACTAGGACTAGGGCTCA  
AGACTGAACACTCCGGGAATAACACTGGCTCACTTTAGAAAAGAGAAACACCCAGCTGAGTGTGGA  
AAATCTTACTTGTATCGCAATAGCACTACATCTGTTCCCTAGGTAGCTGCTTCCAGGGATGGT  
ACAAGTATTGGCAGTCAGTCATCTACATGTCAGTGAGGACAGGGAGGGTGGCCAGGACACGAGGATG  
TGAATCGACCTACTATTAATATAATGGCTGTGAGAAAAGGCTCTTCCCTTCACTTTGCTC  
CACCCCTATCAGGAG

Human GOSR2 mRNA sequence - var3 (public gi: 21961348) (SEQ ID NO: 71)  
GGCCTGCCGGCGCGACATGGATCCCCTGTCAGCAAACGACAAGCAGGTCCACGAGATCCAGTC  
TGCATGGGACGCCCTGGAGACGGCAGACAAGCAGTCAGTCACATAGTAGAAAACGAAATCCAAGCA  
TAGACCAAGATACTCAGGGCTCTAGAACGTCAGGAGATTTCAGCAAGGAGCCCTAACAAAAGGCA  
AAATGCCAGACTCAGGGCTCTAGAACGTCAGGAGATTTCAGCAAGGAGCCCTAACAAAAGGCA  
CAGCATCGGCCATGCAAGGGAGCAGCAGGAGAGACAGCGAGAAGAGCTCTGTCGAACCTTCACCA  
CTAACGACTCTGACACCACCATACCAATGGACGAATCACTGCAGTTAACCTCCCTCCAGAAAGTCA  
CAACGGCATGGATGACCTCATTTAGATGGCACAATATTTAGTGGACTGAGGACCCAGAGACTGACC  
TTGAAGGTGGGTCCCTGCTGGGGACAGAGAGAAGGCTCTGTTAGCCTCATCCACAGTTAGTA  
ACTGTGTTATATTTGATTACGTGTCCTCAAATTGTGATATTTGATGACAAGACAGGCCCTTGAGTT  
TGGGATCCTTCTGTTGGAGTTGAGTTATTGTGAGCCTGAAAGTACCCAGTTGCCAGTGCTTGAA  
ACAAACCATGAAGTGGCCTCTTCTAGGATCCAGGTCTTCCATTACTGAACATGAAAGTGAG  
TGCTACTACGAGGGTCAATCACAGGTGAGAAATTGTGTTACAGAAACTCTACTCTGGAGAATGAAGA  
CGTGGCTGCTTTGGTACCTCGCTTAAGGTGGCTTCCCTAGGACCCCTACTGTGGACTGCCCTATA  
ACTAAAACCTTTGTTAGTAACGACTGTAACATCCCCTACTGTGAGCTGTTAGGGCTGCCAGGGTT  
TAGATTAGAGCTTCTAGAACGACTCTAGAGCTTCTAAAGGCGGTGTTGATCCCAGCGACTCTTCACTCC  
CTAGCCTTCTAGGATTCTCTAGAACGCCCTGACCAGTTGGCAGTGTGAGACTCCAGGCCCTGGAGGGTT  
ACAGAAACATTACACAGACTCTGATGTCAGTCAGTGTTCAGCCTCTGCCCTTCTGTATCAACCC  
TGATGGATAATAGGGCGTGGGTTCTGCTGTTATCAGGGCTGGTCCCCTGTGAATGAAGCACTCCCAGC  
CACTGAGCTGTGAGAAACAGTCACTCGGAAGTGTGAGCTTATCTTAGGTTGATGTTGAGT  
CTGTCAGCTCACAGGACTTCAGTACGTTCTGAACAGTCAGGCCATCTACGGGGAGGGTCAGG  
CAAGCTGCAAGTGCACACTCACCTCTGCTGACAGTTGAGCTCAGATGCCCTGGAAGGGGGTCTCC  
AGCAGCCTGCTGGCGCTCCCTTCTAGAGAGCCACCTGAGCTGACCTGAACCTGATACATGTTGATTAG  
TCTGCCCTTCTTAGAAAAGTGTACTCTCTTCTAGAACGAGGCTCTGTTAAGGCAATGCTAGCTT  
CCAAACTCCATGTCACACTGATGAAGAGCCAGTGGGGTTAGAGCTGCTGTTAAGGCAATGCTAGCTT  
CCCACTCAAGTCTGGCAGCGCTGGGCATCAGCACACCTCTGCCACCCACTGATACCAAGAGGGGAAG  
GCTGTGAGGTGGCTGGGGTTGAGAGACTTGAGGTTCTAACTTCTCTGCAACACCTGTTGCTACCTGGT  
TTTGTCTCTGATTCCCTCCACCTGCTCACACCCCTGCCCTGGGATTTCACCTACACCAATTCAA  
AAGGAACATAGGAGAGGGCATGAAGGGCTAGGGCTGAAGCAGTCTGATGACTGGGCAATTGTGGCTG  
AAAATGAATACATTGAAATTATGGTCAAGTGTGATTAGAAGGGTGTGATCCTAGGCTATA  
CAGTGTGAAATAATCTGTTGAGGCCAGCAGGACTTAGCAAGAGTCTGATTGTATTGTCATA  
TCTCGGGAAAAAAACAAATACATTTCTGATCTGATGGCAATGAAGTTGACTTGTAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

PCT/US04/06308

Human GOSR2 mRNA sequence - var4 (public gi: 16905519) (SEQ ID NO: 72)  
GTTCCGAGGAAGCCAGAGCCGGAGCCGTGGCCTGCCGGCGACATGGATCCCTGTTCCAGCAAAC  
GCACAAGCAGGTCCACGAGATCCAGTCATGGCATGGACGCCCTGGAGACGGCAGACAAGCAGTCTGTGCAC  
ATAGTAGAAAACGAAATCCAAGCAACCAGATATTCAAGCCGCTAGAACGCTCTGGAGATTTGT  
CCAGCAAGGAGCCCCCTAACAAAAGGAAAATGCCAGACTTCGGGTTGACCAGTTAAAGTATGATGTCCA  
GCACCTGCAGACTCGCCTCAGAAACTTCCAGCATCGGCCTGGAGACGGCAGCAGGAGAGACAGCGA  
GAAGAGCTCTGCTCGAACCTTCACCAACTACGACTCTGACACCACATACCAATGGACGAATCACTGC  
AGTTAACCTCCCTCCAGAAAGTTCACAACGGCATGGATGACCTCATTTAGATGGGACAATATT  
AGATGGACTGAGGACCCAGAGACTGACCTTGAGGGGACTCAGAAGAAGATCCTGACATTGCAACATG  
CTGGGTTGTCACACAGTGATGCGGCTCATCGAGAACACTTGGAGGAAGGCTGAGGAGCAGCTGAGCCATTGTT  
GCACCCAAGGATCCTGCCAGACAGCACACTTGGAGGAAGGCTGAGGAGCAGCTGAGCCATTGTT  
TTGAACCTGAGGAGGAGAACAGTCCCACCATCATGCGTGGACTGATAGGACATCTTCTGGGTGTG  
CACCAGTGTCTCCACACTGACAGTGGTTGTTGATGAACCCATGCTGCACCTCAGAGCCAGTC  
CTCTAGTTGGAATAAAGGAGGTGGAAAAAAAAAAAAAA

Human GOSR2 mRNA sequence - var5 (public gi: 12711466) (SEQ ID NO: 73)  
AGCCGGAGCCGTGGCCTGCCGGCGACATGGATCCCTGTTCCAGCAAACGCACAAGCAGGTCCAC  
GAGATCCAGTCATGGCATGGACGCCCTGGAGACGGCAGACAAGCAGTCTGTGCACATAGTAGAAAACGAAA  
TCCAAGCAAGCATAGACCAAGATATTCAAGCCGCTAGAACGCTGGAGATTTGTCCAGCAAGGAGCCCC  
TAACAAAAGGCAAATGCAAGACTTCGGGTTGACCAAGTTAAAGTATGATGTCCAGCACCTGCAGACTGCG  
CTCAGAAACTTCCAGCATCGGCCTGGAGACGGAGCAGCAGGAGAGACAGCGAGAAAGAGCTTCTGTCTC  
GAACCTTCACCAACTACGACTCTGACACCACATACCAATGGACGAATCACTGCAAGTTAACTCTCCCT  
CCAGAAAGTTCAACACGGCATGGATGACCTCATTTAGATGGGACAATATTAGATGGACTGAGGACC  
CAGAGACTGACCTTGAGGGACTCAGAAGAAGATCCTTGACATTGCCAACATGCTGGGCTGTCCAACA  
CAGTGATGCGGCTCATCGAGAACGGCTTCCAGGACAAGTACTTTATGATAGGCAACCAAGGATCCTG  
CCAGACAGCACACTTGGAGGAAGGCTGAGGAGCAGCTGAGCCATTGTTCTGAACCTCTGGAGGC  
AGAAGTCCCCGCACCCATCATGCGTGGACTGATAGGACATCTTCTGGGTGTGCACCAAGTGCCTTCCAC  
ACTTGACAGTGGTTGTTGATGAACCCATGCTGCACCTCAGAGCCAGTCCTAGTTGGAATAA  
AAATTGCAAGAGGTGGAAAAAAAAAAAAAA

Human GOSR2 mRNA sequence - var6 (public gi: 37805253) (SEQ ID NO: 74)  
CAATAGAGACAAGGTCTTGCTCTGTCACCCAGGGTGGAGTACAGTGGCATGATCTGATTCACTACAACC  
TCTACCTCTGGITCAAGCGATCCTCCCACCTCGGTCTTGAGTAGCTGGAAATACAGTTATAATTAT  
TCAATATGTTCCCACTGACTGAGGAAAACAAGCATGTTGGCCAGTTGCTCAATACTGGTACTTGTCC  
AAGATGTATCTCAGATTCTGTTGTTGATTTTCATGCACCTTACAAACTTCCATACAAGATGAAGAAA  
CTGAGATACAGAGAGGTTAAGCAACCTCCAAAGTTCTAGGGTTACAGGTGTTAGCCACTGTACCTGGCC  
TCTAAGGTGATTCTGATGTGTATTTGGAACCACTGTCTCTAGACAGAAAGCTCTGTCTCAAAGAT  
GATCACATTGGTGTAAAGAGCAAAACTGTTAAAGTCCAAAATAATTCTTACTGTTATATCCTAAAAAA  
AAAAAAAAAAAAAAAAAAAAAA

Human GOSR2 mRNA sequence - var7 (public gi: 16905521) (SEQ ID NO: 75)  
GTTCCGAGGAAGCCAGAGCCGGAGCCGTGGCCTGCCGGCGACATGGATCCCTGTTCCAGCAAAC  
GCACAAGCAGGTCCACGAGATCCAGTCATGGACGCCCTGGAGACGGCAGACAAGCAGTCTGTGCAC  
ATAGTAGAAAACGAAATCCAAGCAAGCAGATATTCAAGCCGCTAGAACGCTGGAGATTTGT  
CCAGCAAGGAGCCCCCTAACAAAAGGAAAATGCCAGACTTCGGGTTGACCAAGTTAAAGTATGATGTCCA  
GCACCTGCAGACTGCGCTCAGAAACTTCCAGCATCGGCCTGGAGACGGCAGCAGGAGAGACAGCGA  
GAAGAGCTCTGCTCGAACCTTACCAACTACGACTCTGACACCACATACCAATGGACGAATCACTGC  
AGTTAACCTCCCTCCAGAAAGTCAACACGGCATGGATGACCTCATTTAGATGGGACAATATT  
AGATGGACTGAGGAGCCAGAGACTGACCTTGAGGGACTCAGAAGAAGATCCTGACATTGCCAACATG  
CTGGGCTTGTCACACAGTGATGCGGCTCATCGAGAACGGCTTCCAGGACAAGTACTTTATGATAG  
GTGGGATGCTGTCACCTGTGTTGTCATGTTCTGTTGTCAGTACCTGACATGAGCCAGCCACGCTCA  
GTGGCTGAACAGCATTCCCACAGCTGCAAGTGTGTTGTTGAAAGAGAGAGGGGGCCAGAGGCC  
GCCCTTGTAAATGTTGCTGTCATGAACTGTGAGACACTTGGGAGTGTGTTGTCATTTCCAAAAAA  
AAAAAAAAAAAAAA

Human GOSR2 protein sequence - var1 (public gi: 16307241) (SEQ ID NO: 244)  
MDPLFQQTHKQVHEIQSCMGRLETADKQSVMHVNEMIQASIDQIFSRLERLEILSSKEPPNKRQNARLRV  
DQLKYDVQHLQTALRNQFHRRHAREQQERQREELLSRTFTNDSDTTIPMDESLQFNSSLQKVHNGMDL  
ILDGHNILDGLRTQRLLTKGTQKKILDIANMLGLSNTVMRLIEKRAFQDKYFMIGGMLLCVVMFLVVQY  
LT

Human GOSR2 protein sequence - var2 (public gi: 16905522) (SEQ ID NO: 245)  
MDPLFQQTHKQVHEIQSCMGRLETADKQSVHIVENEIQASIDQIFSRLERLEILSSKEPPNKRNQARLRV  
DQLKYDVQHLQTALRNFQHRRHAREQQERQREELLSRTFTNDSDTTIPMDESLQFNSSLQKVHNGMDDL  
ILDGHNILDGLRTQRLTLKGTOKKILDIANMLGLSNTVMRLIEKRAFQDKYFMIGGMLLTCVVMFVVQY  
LT

Human GOSR2 protein sequence - var3 (public gi: 12711467) (SEQ ID NO: 246)  
MDPLFQQTHKQVHEIQSCMGRLETADKQSVHIVENEIQASIDQIFSRLERLEILSSKEPPNKRNQARLRV  
DQLKYDVQHLQTALRNFQHRRHAREQQERQREELLSRTFTNDSDTTIPMDESLQFNSSLQKVHNGMDDL  
ILDGHNILDGLRTQRLTLKGTOKKILDIANMLGLSNTVMRLIEKRAFQDKYFMIGTQGSCQTAHFGGRSA  
GSS

Human GOSR2 protein sequence - var4 (public gi: 21961349) (SEQ ID NO: 247)  
MDPLFQQTHKQVHEIQSCMGRLETADKQSVHIVENEIQASIDQIFSRLERLEILSSKEPPNKRNQARLRV  
DQLKYDVQHLQTALRNFQHRRHAREQQERQREELLSRTFTNDSDTTIPMDESLQFNSSLQKVHNGMDDL  
ILDGHNILDGLRTQRLTLKGTOKKILDIANMLGLSNTVMRLIEKRAFQDKYFMIGGMLLTCVVMFVVQY

Human GOSR2 protein sequence - var5 (public gi: 2316088) (SEQ ID NO: 248)  
MDPLFQQTHKQVHEIQSCMGRLETADKQSVHIVENEIQASIDQIFSRLERLEILSSKEPPNKRNQARLRV  
DQLKYDVQHLQTALRNFQHRRHAREQQERQREELLSRTFTNDSDTTIPMDESLQFNSSLQKVHNGMDDL  
ILDGHNILDGLRTQRLTLKGTOKKILDIANMLGLSNTVMRLIEKRAFQDKYFMIGGMLLTCVVMFVVQY  
LT

Human GOSR2 pray sequence - var1 (SEQ ID NO: 76)  
AGCGCCGCCATGGNAGTACCCATNCAGTACAGATTACGCTCATATGGCCATGGAGGCCAGTGAATTCA  
CACCCAAGCAGTGGTATCAACGCAGAGTGGCCATTATGGCCGAAACCGGAAGGGGGCTGTGAGGACGT  
GTTCCGAGGAAGCCAGACCCGGAGCCGGCTGGCTGCCGGGCGACATGGATCCCTGTTCCAGCAAAC  
GCACAAGCAGGTCCACGAGATCCAGTCTTGATGGACGCCCTGGAGACGGCAGACAAGCAGTCTGTGCAC  
ATAGTAGAAAAGAAATCCAAGCAAGCATAGACCAAGATATTCAAGCCGCTTAGGACGCTGGAGATTTGT  
CCAGCAAGGAGCCCCCTAACAAAAGGCAAATGCCAAACTTCGGGTTGACCAGTTAAAGTATGATGTCCA  
GCACCTGCAAGACTGCGCTAGAAACTCCAGCATCGGCGCNATGCAAGGGAGCAGGGAGAGACAGCGA  
GAAGANCTNTGTCCTNAACCTAACCNNTACCAANTTGACNCCCCCTNCCATTGACCAAATANTNGN  
NGTTAACNTNCCTCCCNAAAAGTTACAAACGGCTTGNNNAACNTANTTTAAAGGGNCCNATTTTT  
TNAATNGCCTGGGNCCAAAACCTCCTTNGNGGGGGNCCNTTGGGGGAAAAAAANGCCC  
TTTTTTTANCCCNNNCAANNTNAANACNGNNNNTTTTNAANCNGNNCCCAAAGAGGGGAN  
TTTNNNAAANAAAACNCCCCCTNTGGGGGCCTNTTGGGGNGGANNTTTGNNCCNNAAAA  
ACCCNTTTNTNNGGNGAAAAAAAGNNNNNTNTNTA

Human HERPUD1 mRNA sequence - var1 (public gi: 16507801) (SEQ ID NO: 77)  
AGAGACGTGAACGGTCGTGAGAGATTGCGGGCGGCTGAGACGCCGCTGCCACCTAGGAGCGCA  
GCGGAGCCCGACACCGCCGCCGCCATGGAGTCCGAGACCGAACCCGAGCCCGTCACGCTCTGGTG  
AAGAGCCCCAACCGCGCACCGCGACTTGGAGCTGAGTGGCGACCGCGCTGGAGTGTGGCCACCTCA  
AGGCCAACCTGAGCCCGCTCACCCCGAGCGTCGCCGTCCAGAGGACAGAGTTAATTCTGGAA  
GCTGTTGTTGATACCAATGTCTCAGGGACTTGCTTCAAAGGAAAACGGCATGTTTGATCTGGTG  
TCAATGTGAAGAGTCTTCAAAATGCCAGAAATCAACGCCAAGGTGGCTGAATCCACAGAGGAGCCTG  
CTGGTTCTAATCGGGGACAGTATCTGAGGATTCTCAAGTGTGATGGTTAAGGAAAGGGAAAGTTCTCG  
GAACCTTCTCCCTGGATGGAAAACATCTCAAGGCACTACGTTGGTGGTTCCATTAGACCGAGG  
CCGGTTCAGAACTTCCCAAATGATGGCTCTCCCTGACGGTGTAAATCAGGACCCAAACAATAACTTAC  
AGGAAGGCAGTGTCTGAAACTGAAGACCCAAACCACCTCCAGACAGGGATGTACTAGATGGCGA  
GCAGACCGCCCTCTTTATGAGCACAGCATGGCTTGTCTCAAGACTTCTTGCCTCTCTTCCA  
GAAGGCCCCCAGCCATCGCAAACGTGATGGTGTGAGCTGTGGAGGCTTGACAGGAATGG  
CTGGATCACCTGACTCCAGCTAGATTGCTCTGGACATGGCAATGATGAGTTTAAAGGAAACAGTGT  
GGATGATGATGATGTTGTGAGCAAGAAAAGCAGAAACGTGAAGCCGTGATACAAATTGGTGAACAAA  
AAATGCCAAGGCTCTAGGTGTTGATGTCTATGCTTGTGAGGAAACTTCTTCAAATGTGTGTCTGCAT  
CTGTACGTAGAAGGCTTAGGTGTTGATGTCTATGCTTGTGAGGAAACTTCTTCAAATGTGTGTCTGCAT  
GTGTGTTGTACATAGAAGTCACTAGATGCGAGAAGTGGTTCTGCTGGTACGATTTGATTCTGTGGAAATG  
TTAATTACACTAAGTGTACTACTTTATATAATCAATGAAATTGCTAGACATGTTTAGCAGGACTTT  
CTAGGAAAGACTATGTATAATTGCTTTAAATGCACTGCTTTACTTTAAACTAAGGGAAACTTGCG  
GAGGTGAAAACCTTGTGGTTCTGTTCAATAAAAGTTTACTATGAATGACCTGAAAAAA  
AA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Human HERPUD1 mRNA sequence - var2 (public gi: 10441910) (SEQ ID NO: 78)  
GCTGTGTGGCCAGGTTCTCAAACCTCTGAGGGCAAGCGATCCTCCACCTCAGCCCTGAGTAGC  
TGGGACTAACAGGCATGTGCCACTAGACCTGGCTAAAGACATATATGACACACGAAACCATTATTTT  
CATTCAACAATGTTATTACATATATGGTATTAGTATTCTAATGTAGTGACTCTAAATTGCAATT  
ATATTCTAGAACATCTGAACAGAGCATAGGAATTCCCTATTTCGCAATTATCAGITCTAACAAAAAAT  
CTTAAAAGCACTTATCATTCTATTCCCTGCACTGTAATTTTAAATGATCAAAACAGTATCATACT  
CAAGGCTTACTTATATTGAATACTATTAGAAAGTTGTGGCTGGGTGTATTATAAATCTGTTGG  
TCAGATGTCTGCAATGAGTAATTAGCACCATTATCAGGAAGCTTCTACCAATGACAACCTTCAATTGG  
AAGATTAAATGAAAGTGTAGCATACTCTAGGGAAAAAATATGAATATTAGCATCTATGTATTGAAAAA  
TTATGTTGAATAATGTCAGACTATTTCATACATACGTTCTGTTAATTGTCACGTTAGG  
TGGGGGTAGGAGATGTAAGCCCCTGACAGCAAAATTCTTGTGATTCAGACAGTTGCA  
GCTCTTGTCTGTGTTACACTTATTAGTGGCTGAATCCACAGAGGAGCCTGCTGTTCTA  
ATCGGGGAGCAGTACCTGAGGATTCTCAAGTGATGGTTAAGGCAAAGGGAGTTCTCGGAACCTTTC  
TTCCCTGGATGGAAAACATCTCAAGGCTGAACTGCCCAGCAGGCAATTCCAAGGCCTGGTCTGGT  
TTCTCGGTTACACACCCATTGGGTGGCTCAGCTTCTGGTCCAGCAGAATATGCA  
ACATGCAATATTAGCAGCCACTGCTGCATCAGGGCTTTGTTCCACCAAGTGCACAAGAGATA  
TGTGGTCTCTGCACCTGCTCCAGCCCCATTACACAACCAGTTCCAGTGA  
AATGCTGCTCTCAAGTGGTTAACCTGGAGCCAATCAAATTGGGAGTGAATGCCACAAGGTGGCC  
CTATTGGAAGAAGATGATGAAATAATCGAGATTGGTTGGATTGGACCTATTCA  
TGTTTTCTCAGTATCCTCTACTTCACTCCTCCCTGAGCAGATTCTCATGGTCA  
GTTATGTACCTGCATCACGTTGGGTGTTCCATTAGCAGGGAGGCGGTT  
CAGAACACTCCCAATGATGAGTTTAAACAGTGTGGATGATGATGTTTGAGCA  
GTCCTCTCCCTGACAGTGAAGGCAACCTCCAGACAGGGATGTA  
AGACCCCCAACACCCCTCCAGACAGGGATGTA  
CTAGATGGCAGCAGACAGCCCTCCAGCCATCGCAAAACT  
ACAGCATGGCTGTCTCAAGACTTTCTTGCCTCTCTTCTCCAGA  
AGGGTGTGTTGCTGTAGCTGTTAGGCTTGA  
TGCAGGAACTGGACTGGATCACCTGACTCCAGCTAG  
AGACAGGAACTGGGTTCTGCTGGTACGTTGATTCTGTTGA  
TGCAGGAACTGGGTTCTGCTGGTACGTTGAGGACTTTCTAGGAAAGAC  
TTATGTTGAGGAACTTTGCTGGGAGGTGAAACCTTGTGCTGGTT  
CTGTTCAATAAGTTTACTATGAATGACAAAAAAAAAAAAAA

Human HERPUD1 mRNA sequence - var3 (public gi: 3005722) (SEQ ID NO: 79)  
GGCCACCTCAAGGCCACCTGAGCCGCTCACCCGAGCGTCCGCTCAGAGGACAGAGGTTAATT  
ATTCTGGGAAGCTGTTGATCACCAATGTCAGGGACTTGTCTTCAAAAGGAAAACGGCATGTTT  
GCATCTGGTGTCAATGTAAGAGTCTTCAAAAGGCAAAATCAACGCCAACGGCTGAATCCACA  
GAGGAGCCTGCTGGTCTAATCGGGACAGTACCTGAGGATTCTCAAGTGATGGTTAAGGCAAAGGG  
AAGTTCTCGAACCTTCTCCCTGGATGGAAAACATCTCAAGGCTGAAAGCTGCCAGCAGGCATT  
CCAAGGCTGGCTCTGGTTACACACCCCTATGGGGCTCAGCTTCTGGTTCCAGCAG  
ATATATGCAAGACAGTACTACATGCAATATTAGCAGCCACTGCTGCATCAGGGCTTTGTTCCAC  
CAAGTGCACAAGAGATAACCTGCTGGTCTCTGCACCTGCTCCAGCCCCATTACACA  
AAACAGCCTGCAATCAGAATGCTGCTCTCAAGTGGTTAACCTGGAGCCAATCAAATTGGGG  
ATGAATGCACAAGGTGGCTTATTGTTGAGAAGAGATGATGAAATAATCGAGATTGGTTGGATTGGACCT  
ATTCACTGAGCTACATTCTGTTCTCACTGATCTCTACTTCACTCCTCCCTGAGCAGATTCTCAT  
GGTCATGGGGCCACCGTTGTTATGACCTGCATCACGTTGGGGCTTCCATTAGACCGAGGCCGGTT  
CAGAACTTCCAAATGATGGCTCTCTGAGCTGTTGTAATCAGGACCCCAACATAACTACAGGAAG  
GCACTGATCTGAAACTGAGACGCCAACACCCCTCCAGACAGGGATGTA  
CTAGATGGCAGCAGAC  
CCCCCAGCCCTTATGAGCACAGCATGGCTTGTCTCAAGACTTTCTTGCCTCTTCTCCAGAAGGG  
CACCTGACTCCAGCTAGATTGCTCTCTGGACATGGCAATGATGAGTTTAAACAGTGTGGATGA  
TGATATGTTTGTGAGCAAGCAAAGCAGAAACGTGAAGCCGTGATACAAATTGGTAACAAAAAATGC  
CCAAGGCTCTCATGTTATTCTGAAGAGCTTAAATATATACTCTATGTTAATAAGCACTGTAC  
GTAGAAGGCCCTAGGTGTTGCACTGCTATGCTTGTGAGGAACTTTCAAATGTTGCTGCTGCA  
TTGTACATAGAAGTCATAGATGCAAGAGTGGTCTGCTGGTACGATTGATTCTGTTGGAAATGTTAAA  
TTACACTAAGTGTACTACTTATATAATCAATGAAATTGCTAGACATGTTAGCAGGACTTTCTAGGA  
AAGACTTATGTTAATTGCTTTAAACATGCAAGTGTCTTACTTAAACTAAGGGAACTTTGCGGAGGTG  
AAAACCTTGCTGGTTCTGTTCAATAAGTTTACTATGAATGACCCCTGAAAAAA  
AAAA

PCT/US04/06308

Human HERPUD1 mRNA sequence - var4 (public gi: 21619176) (SEQ ID NO: 80)  
CCACCGTCCGGTCGTTGAGAGATTGCGGGCGGTGAGACGCCGCTGCCCTGGCACCTAGGAGCGCAG  
CGGAGCCCCGACACCGCCGCCGCATGGAGTCCGAGACCGAACCCGAGGCCGTCACGCCCTGGTGA  
AGAGCCCAACCAGGCCACCGCAGTGGAGCTGAGTGGCGACCGCGGTGGAGTGTGGGCACCTCAA  
GGCCACCTGAGCCGCTCACCCAGCGTCCAGAGGACCAAGGGTAAATTATTCTGGGAAG  
CTGTTGTTGGATACCAATGTCAGGGACTTGCTTCCAAAGCAGGAAAACCGCATGTTTGCACTGG  
TGTGCAATGTGAAGAGTCCTTCAAAATGCCAGAAATCAACGCCAAGGGTGGCTGAATCCACAGAGGCC  
TGCTGGTCTAATCGGGGACAGTATCCCTGAGGATTCTCAAGTGTGATGGTTAAGGAAAGGGAAAGTCTT  
CGGAACCTTCTCCCTGGATGGGAAACATCTCAAGGCCCTGAAGCTGCCACGCCAGGCACTTCAAAGGCC  
TGGGTCTGGTTCTCCGGTACACACCTATGGGGCTTCAGCTTCTGGTCCAGCAGATAATGC  
ACGCACTACTACATGCCAATATTAGCAGCCACTGCTGCATCAGGGCTTGTCCACCACCAAGTGC  
CAAGAGATACCTGTGGTCTGCACCTGCTCCAGCCCTATTACAACCAAGTCCAGCTGAAACCCAGC  
CTGCCAATCAGAAATGTCCTCAAGTGGTTGTTAATCCTGGAGCCAATCAAATTGCGGATGAATGC  
ACAAGGTGGCCATTGTGAGAAGATGATGAAATAATCAGAGATTGGGGATTGGACCTATTAGCA  
GCTACATTTCTGTTTCTCAGTATCCTACTTCTACTCCTCCCTGAGCAGATTCTCATGGTCATGG  
GGGCACCGGTTTATGTACCTGCATCACGGTGGGTTCCATTAGACCGAGGGCGGTTCAGAACTT  
CCCAATGATGGCCTCCTCTGACGTGTAATCAGGACCCAAACAATAACTACAGGAAGGCAGTGT  
CCTGAAACTGAAGACCCAAACACCTCCCTCCAGACAGGGATGACTAGATGGCGAGCAGACCC  
CCTTATGAGCACAGCATGGCTCTCAAGACATTCTTCTCTCTTCAAGGCTTCTCTTCCAGAAGGCC  
CATCGCAAATGATGGTGGTGTGCTGAGCTGTTGGGCTTGTGACAGGAATGGACTGGATCACCTGAC  
TCCAGCTAGATTGCCCTCTCTGGACATGGCAATGATGGATGAGTTTAAACAGTGTGGATGATGATATGC  
TTTGTGAGCAAGCAAAGCAGAACAGCTGAGCCGTGATACAATAATTGGTAACAAAAATGCCAAGGCTT  
CTCATGTCATTCTGAAGAGCTTAATATATACTCTATGTTAAGACTGTACGTAGAAAGGC  
CTTAGGTGTTGTCATGCTATGGTGGAACTTTCCAATGTTGCTGTCATGTTGACATA  
GAAGTCATAGATGCAAGGGTCTGCTGGTACATTGATTCTGTTGAATGTTAAATTACACTAA  
GTGACTACTTATATAATCAATGAAATTGCTAGACATGTTAGCAGGACTTTCTAGGAAAGACTTAT  
GTATAATTGCTTTAAATGCACTGTTACTTAAACTAAGGGAACTTGGGAGGTGAAACCTT  
GCTGGGTTCTGTTCAATAAGTTTACTATGAATGCCCTGAAAAAAAAAAAAAA

Human HERPUD1 mRNA sequence - var5 (public gi: 14249882) (SEQ ID NO: 81)  
AACGGTCGGTGCAGAGATTGCGGGCGCTGAGACGCCGCTGCCCTGGCACCTAGGAGCGCAGCGGAGCCC  
CGACACCGCCGCCGCCATGGAGTCCGAGACCGAACCCGAGGCCGTCACGCCCTGGTGAAGAGGCC  
AACCAGGCCACCGCAGTTGGAGCTGAGTGGCGACCGCGGTGGAGTGTGGGCCACCTCAAGGCC  
TGAGCCGCGTCAACCCGAGCGTCCCGTCCAGAGGACCAAGGGTAATTATTATTCTGGGAAGCTGTT  
GGATCACCAATGTCAGGGACTTGCTTCCAAGCAGGAAAACCGCATGTTGCAATCTGGTGTGCAAT  
GTGAAGAGTCCTCAAAATGCCAGAAATCACGCCAAGGGCTGAATTCACAGAGGAGCCTGGT  
CTAATGGGACAGTATCTGAGGATCCTCAAGTGTGTTAAGGCAAGGGAGTTCTCGGAACCT  
TTCTTCCCTGGATGGGAAACATCTCAAGGCTGAGCTGCCAGCAGGATTCCAAGGCC  
GGTTTCTCCGGTTACACACCTATGGGTGGCTCAGCTTCTGGTCCAGCAGATAATGCACGACAGT  
ACTACATGCCAATATTAGCAGCCACTGCTGCATGGGCTTGTGTTCCACCACCAAGTGCACAAGAGAT  
ACCTGTTGCTCTGCACCTGCTCCAGCCCTATTCAACAACAGTTCCAGCTGAAACCAAGCCTGCC  
CAGAATGCTGCTCTCAAGTGGTGTAAATCTGGAGCCAATCAAATTGCGGATGAATGCACAAGGTG  
GCCCTATTGTTGAGAAGATGATGAAATAATCGAGATTGGTGGATGGACCTATTCAAGCAGCTACATT  
TTCTGTTTCTCAGTATCTCTACTCTACTCTCCCTGAGCAGATTCTCATGGTCATGGGGGCC  
GTTGTTATGACCTGCATCAGTGGGTTCCATTAGACCGAGGGCGGTCAAGAACCTTCC  
ATGGTCCTCTCTGACGTTGTAATCAGGACCCAAACAATAACTACAGGAGGGACTGATCTGAAAC  
TGAAGACCCCAACCACCTCCCTGAGACAGGGATGACTAGATGGCGAGCAGACGCC  
AGCACAGCATGGTTGCTCTCAAGACTTCTTGTCTCTCTTCCAGAAGGCC  
ACTGATGGTGGTTGTGCTGAGCTGTTGGGGCTTGTGACAGGAATGGACTGGATCACCTGACTCC  
GATTGCCCTCTCTGGACATGGCAATGAGTTTAAACAGTGTGGATGATGATATGTTGTGA  
GCAAGCAGGAAACAGTGAAGGCCGTCACAAATTGGTGAACAAAAATGCCCAAGGCC  
CTTATTCTGAAAGAGCTTAATATATACTCTATGTTAAGACTGTACGTAGAAGGCC  
GTGCTGATGTCATGCTGAGGAACCTTCCAATGTTGCTGTCATGTTGACATAGAAGTCA  
TAGATGCAAGAGTGGTCTGCTGGTACATTGATTCTGTTGAATGTTAAATTACACTAAGTGTACT  
ACTTTATATAATCAATGAAATTGCTAGACATGTTAGCAGGACTTTCTAGGAAAGACTTATGTATAAT  
TGCTTTTAAATGCACTGTTACTTAAACTAAGGGAACTTGGGAGGTGAAACCTTGGT  
TTCTGTTCAATAAGTTTACTATGAAAAAA

Human HERPUD1 mRNA sequence - var6 (public gi: 12652674) (SEQ ID NO: 82)  
GAACGTGTCGGTGCAGAGATTGCGGGCGCTGAGACGCCGCTGCCCTGGCACCTAGGAGCGCAGCGGAGCC  
CCGACACCGCCGCCGCCATGGAGTCCGAGACCGAACCCGAGGCCGTCACGCCCTGGTGAAGAGGCC  
CAACCGGCCACCGCAGCTGGAGCTGAGTGGCGACCGCGGTGGAGTGTGGGCCACCTCAAGGCC

CTGAGCCCGTCTACCCGAGCGTCCGGTCCAGAGGACCAGAGGTTAATTATCTGGGAAGCTGTTGT  
TGGATCACCAATGTCTCAGGGACTTGCTTCAAAGCAGGAAAACGGCATGTTTGCATCTGGTGTGCAA  
TGTGAAGAGTCCTCAAAATGCCAGAACATCAACGCCAAGGTTGGCTGAATCCACAGAGGAGCCTGCTGGT  
TCTAATCGGGACAGTATCTGAGGATTCCTCAAGTGTGTTAAGGCAAAGGGAAAGTCTTCGGAACC  
TTTCTTCCCCTGGATGGAAAACATCTCAAGGCTGAAAGCTGGCCAGCAGGATTCCAAGGCCTGGTCC  
TGGTTTCTCCGGTACACACCCATGGGTGGCTTCAGCTTCTGGTTCAGCAGATAATGCACGACAG  
TACTACATGCAATTAGCAGGCACTGCTGCATCAGGGCTTGTGTTCCACCACCAAGTGCACAAGAGA  
TACCTGTGGTCTCTGCACCTGCTCAGGCCCCTATTCAACACAGTTCCAGCTGAAAACAGCCTGCCAA  
TCAGAATGCTGCTCCTCAAGTGGTTGTAATCTGGAGCCAATCAAATTGCGGATGAATGCACAAGGT  
GGCCCTATTGGAAGAAGATGATGAAATAATCAGAGATTGGTGGATTGGACCTATTCAAGCAGCTACAT  
TTCTGTTTCTCAGTATCCTCTACTCTACTCCTCCCTGAGCAGATTCTCATGGTATGGGCCAC  
CGTTGTTATGTAACCTGCATCACGTTGGGTGTTCCATTAGACCGAGGGCGGTTGAGAACTTCCCAAAT  
GATGGTCCCTCCCTGACGTTGTAATCAGGACCCAAACAATACTTACAGGAAGGCACTGATCTGAAA  
CTGAAGACCCCAACCACCTCCCTCAGACAGGGATGTAAGATGGCGAGCAGACCAGCCCCCTCTTAT  
GAGCACAGCATGGCTTGTCAAGACTTTCTTGCCTCTTCCAGAAGGCCCCCAGCCATCGCA  
AACTGATGGTGTGTTGCTGAGCTGTTGGAGGCTTGACAGGAATGGACTGGATCACCTGACTCCAGCT  
AGATTGCCTCTCTGGACATGGCAATTGATGAGTTTTAAAAACAGTGTGGATGATGATATGCTTTGTG  
AGCAAGCAAAAGCAGAACAGTGTGAAAGCAGGATGACATAAAATTGGTAACAAAAAATGCCAAGGCTTCTCATG  
TCTTAACTGAAAGAGCTTAAATATACTCTATGTTAATAAGCACTGTACGTAGAAGGCCCTAGG  
TGTGCAATGTAAGAGCTCTTAAATATACTCTATGTTAATAAGCACTGTACGTAGAAGGCCCTAGG  
ATAGATGCAGAAGTGGTTCTGCTGGTACATTGATTCTGTTGAATGTTAAATTACACTAAGTGTAC  
TACTTTATATAATCAATGAAATTGCTAGACATGTTTAGCAGGACTTTCTAGGAAAGACTTATGTATAA  
TTGCTTTTAAATGCACTGCTTACTTTAAACTAAGGGAACTTGCAGGTTGAAAACCTTGTGCTGGG  
TTTCTGTTCAATAAGTTTACTATGAATGAAAAAAAAAAAAAA

Human HERPUD1 mRNA sequence - var7 (public gi: 9711684) (SEQ ID NO: 83)  
AGAGACGTGAACCTGCGTGCAGAGATTGCGGGCGCTGAGACGCCGCTGGCACCTAGGAGCGA  
GCGGAGCCCCGACACCGCCGCCGCGCATGGAGTCCGAGACCGAACCGAGCCCGTCACGCTCTGGTG  
AAGAGCCCCAACCGCGCCACCGCGACTTGGAGCTGAGTGGCGACCGCGCTGGAGTGTGGGCCACCTCA  
AGGCCCACCTGAGCCGCGTCTACCCCGAGCGTCCGCGTCCAGAGGACCAGAGGTTAATTATCTGGGAA  
GCTGTTGTTGGATCACCAATGTCTCAGGGACTTGTCTTCAAAGCAGGAAAACGGCATGTTTGCATCTG  
GTGTGCAATGTAAGAGCTCTTAAATGCAACCGCAAGGCGGCTGAATCCACAGAGGAGC  
CTGCTGGTCTAATCGGGACAGTATCCTGAGGATTCCTCAAGTGTGTTAAGGAAAGGGAAAGTCT  
TCGGAACCTTCTTCCCTGGATGGAAAACATCTCAAGGCTGAAAGCTGCCAGCAGGATTCCAAGGC  
CTGGTCTGGTTCTCCGGTACACACCCCTATGGTGGCTTCAGCTTCTGGTCCAGCAGATAATG  
CACAGACAGTACTACATGCAATTAGCAGGCCACTGCTGCATCAGGGCTTTGTTCCACCAAGTGC  
ACAAGAGATACTGTGGTCTGCACTGCTCCAGCCCTATTACAACCAAGTTCCAGCTGAAAACCAG  
CTGCAATCAGAATGCTGCTCTCAAGTGGTTTAATCTGGAGCCAATCAAATTGCGGATGAATG  
CACAGGCGCCATTGTTGAGAAGATGATGAAATAAAATCGAGATTGGTGGATTGGACCTATTGAG  
AGCTACATTTCTGTTTCTCAGTATCCTCTACTCTACTCCCTGAGCAGATCCTCATGGTATG  
GGGCCACCGTTTATGACCTGCATCACGTTGGTGGTTCCATTAGACCGAGGCCGTTGAGAAGT  
TCCCAATGATGGTCTCTCTGACGTTGTAATCAGGACCCAAACAATAACTTACAGGAAGGCAGTGA  
TCCAGAAACTGAGACCCCAACCACCTCCCTCAGACAGGGATGTAAGATGGCGAGCAGACAGCCCC  
TCTTATGAGCAGCATGGCTTGTCTCAAGACTTTCTTGCCTCTTCTCCAGAAGGCCCCCAG  
CCATCGCAAAGTGTGGTTGTGAGCTGGAGGCTTGTAGCTTGGAGGCTTGTAGCTGAGGATGGATCACCTGA  
CTCCAGTAGATTGCTCTCTGGACATGGCAATTGAGTTTTAAAAACAGTGTGGATGATGATATG  
CTTGTGAGCAAAGCAGAACAGTGAAGCCGTGATAACAATTGGTAACAAAAATGCCAAGGC  
TTCTCATGTCCTTATTCTGAAGAGCTTAATATATACTCTATGTTAATAAGCACTGTACGTAGAAG  
GCCCTAGGTGTTGCATGCTATGCTGAGGAACCTTCCAAATGTGTGCTGCATGTGTTGTACA  
TAGAAGTCATAGATGCAGAAGTGGTCTGCTGGTACGATTGATTCTGTTGAAATGTTAAATTACACT  
AAGTGTACTACTTATATAATCAATGAAATTGCTAGACATGTTTAGCAGGACTTTCTAGGAAAGACTT  
ATGTATAATTGCTTTTAAATGCACTGCTTACTTTAAACTAAGGGAACTTGCAGGTTGAAAACCT  
TTGCTGGTTCTGTTCAATAAGTTTACTATGAATGACCCCTG

Human HERPUD1 mRNA sequence - var8 (public gi: 3005718) (SEQ ID NO: 84)  
GACGTGAACGGTGTGAGAGATTGCGGGCGCTGAGACGCCGCTGGCACCTAGGAGCGCAGCG  
GAGCCCCGACACCGCCGCCGCGCATGGAGTCCGAGACCGAACCGAGCCCGTCACGCTCTGGTGAAG  
AGCCCCAACAGCGCCACCGCGACTTGGAGCTGAGTGGCGACCGCGGGCTGGAGTGTGGGCCACCTCAAGG  
CCCACCTGAGCCGCGTCTACCCCGAGCGTCCGCGTCCAGAGGACCAGAGGTTAATTATCTGGGAAGCT  
GTTGTTGGATCACCAATGTCTCAGGGACTTGTCTTCAAAGCAGGAAAACGGCATGTTTGCATCTGGTG  
TGCAATGTAAGAGACTCCTCAAAATGCCAGAACATCAACGCCAAGGTGGCTGAATCCACAGAGGAGCCTG  
CTGGTTCTAATCGGGGACAGTATCCTGAGGATTCCCTCAAGTGTGTTAAGGAAAGGGAAAGTCTTCG

GAACCTTCTCCCTGGATGGAAAACATCTCAAGGCCTGAAGCTGCCAGCAGGATTCCAAGGCCTG  
 GGTCTGGTTCTCGGTTACACACCCATGGGTGGCTCAGCTTCCTGGTCCAGCAGATATATGCAC  
 GACAGTACTACATGCAATATTTAGCAGCCACTGCTGCATCAGGGGTTTGTTCACCCAGAAGTCACA  
 AGAGATAACCTGTGGTCTGACCTGCTCCAGCCCTATTACAACCAAGCTTGAAACCCAGCCT  
 GCCAATCAGAATGCTGCTCTCAAGTGGTTAATCTGGAGCCAATCAAATTTGGGGATGAATGCAC  
 AAGGTGGCCCTATTGTGGAAGAAGATGATGAAATAATCGAGATTGGTTGATGGACCTATTCAAGCAGC  
 TACATTTCTGTTTCTCACTATCCTACTCTACTCCTCTGGTGGATTGGACCTATTCAAGCAGC  
 GCCACCGGTTGTATGTACCTGACCTGCTGGGGTTTCCATTAGACCGAGGGCTTCAAGCAGC  
 CAAATGATGGTCTCTCGTACGTTGAAATCAGGACCCAAACAATAACTACAGGAAGGCAGTCC  
 TGAAACTGAAGACCCAAACCCCTCCAGACAGGGATGACTAGATGGCGAGCAGACCAGCCCCTCC  
 TTATGAGCACAGCATGGCTGTCTCAAGACTTTGCTCTCTTCCAGAAGGGCCCCAGCCA  
 TCGCAAACACTGATGGTGTGTCTGAGCTGGAGGCTTGACAGGAATGGACTGGATCACCTGACTC  
 CAGCTAGATTGCCCTCTGGACATGCAATGATGAGTTTAAAAAACAGTGTGGATGATGATGCTT  
 TTGTGAGCAAGAAAAGCAGAAACGTGAAGCGTGATAAAATTGGTGAACAAAAATGCCAAGGCTTC  
 TCATGTCTTATTCTGAAGAGCTTAATATATACTCTATGAGTTAATAAGCACTGTAGAAGGCC  
 TTAGGTGTTGATGTCTATGCTGAGGAACCTTCCAAATGTGTGTCTGCATGTGTGTTGACATAG  
 AAGTCATAGATGCAAGATGGTCTGCTGGTACGATTGATCTGTTGGAATGTTAAATTACACTAAG  
 TGTACTACTTATATAATCAATGAAATTGCTAGACATGTTTAGCAGGACTTTCTAGGAAAGACTTATG  
 TATAATTGCTTTAAAATGCACTGCTTACTTTAAACTAAGGGAACTTGCAGGAGGTGAAAACCTTG  
 CTGGTTTCTGTTCAATAAAAGTTTACTATGAATGACCTGAAAAAAAAAAAAAA

Human HERPUD1 mRNA sequence - var9 (public gi: 285960) (SEQ ID NO: 85)

CGTGAACGGTCGTTGAGAGATTGCGGGCGGCTGAGACGCCCTGCTGGCACCTAGGAGCGCAGCGA  
 GCCCCGACACCGCCGCCGCGCATGGAGTCCGAGACCGAACCCGAGCCGACGGCTGGAGTGTGGCCACCTCAAGGCC  
 CCCAACAGCGCACCCGCGACTTGGAGCTGAGTGGCGACCCGAGCCGCTGGAGTGTGGCCACCTCAAGGCC  
 CACCTGAGCCCGCTCACCCCGAGCGTCCCGCTCAGAGGACCAAGAGGTTAATTATTCTGGGAAAGCTGT  
 TGTGGATCAAAATGTCAGGACTTCTCAAGCAGAAAACGGCATGTTTGCACTGGTGTG  
 CAATGTGAAGAGTCCTCAAAATGCAAGAAATCAACGCCAGGTGGCTGAATCCACAGAGGAGCCTGCT  
 GGTTCTAATCGGGACAGTATCCTGAGGATTCTCAAGTGTGTTAAGGCAAAGGGAAAGTTCTCGGA  
 ACCTTCTCCCTGGATGGAAAACATCTCAAGGCTGAAGCTGCCAGGGCATTCAGGCCCTGG  
 TCCTGGTTCTCCGGTTACACACCCATGGGTGGCTCAGCTTCTGGTCCAGCAGATATGACGA  
 CAGTACTACATGCAATATTAGCAGCCACTGCTGCATCAGGGCTTTGTTCCACCAAGTGCACAAG  
 AGATACCTGTTGCTCTGCACCTGCTCCAGCCCTATTCAACACCAGTTCCAGCTGAAACCCAGCCTGC  
 CAATCAGAATGCTGCTCTCAAGTGGTGTAAATCCTGGAGCCAATCAAATTTGGGGATGAATGACAA  
 GGTGGCCCTATTGTGGAAGAAGATGATGAAATAATCGAGATTGGTGGATGGACCTATTCAAGCAGCTA  
 CATTTCGTTTCTCACTGATCTCTACTCTACTCCCTGAGCAGATTCTCATGGTCACTGGGG  
 CACCGTTGTTATGTACCTGCATCACGTTGGGTGTTCCATTAGACCGAGGCCGTTCAGAACCTCCA  
 AATGATGGCTCTCCCTGACGTTGAAATCAGGACCCAAACAATAACTACAGGAAGGCACTGATCC  
 AAACGAGACCCAAACCCCTCCAGACAGGGATGACTAGATGGCAGCAGACAGGCCCTC  
 TATGAGCACAGCATGGCTGTCTCAAGACTTTCTGCTCTCTTCCAGAAGGCCAGGCCATC  
 GCAAACGTGATGGTTGCTGTAGCTGGAGGCTTGACAGGAATGGACTGGATCACCTGACTCCA  
 GCTAGATTGCTCTCTGGACATGCCAATGATGAGTTTAAAAACAGTGTGGATGATGATGCTTT  
 GTGAGCAAGCAAAGCAGAAACGTGAAGCCGTGATAAAATTGGTGAACAAAAATGCCAAGGCTTCTC  
 ATGTGTTATTCTGAAGAGCTTAAATATATACTCTATGAGTTAATAAGCACTGTACGTAGAAGGCC  
 AGGTGTTGATGTCTATGCTGAGGAACCTTCCAATGTTGCTGTCTGCAATGTGTGTTGACATAGAA  
 GTCATAGATGCAAGTGGTCTGCTGGTAAGATTGATCTGTTGGAATGTTAAATTACACTAAGTG  
 TACTACTTTATATAATCAATGAAATTGCTAGACATGTTTAGCAGGACTTTCTAGGAAAGACTTATGTA  
 TAATTGCTTTAAAATGCACTGCTTACTTTAAACTAAGGGAACTTGCAGGAGGTGAAAACCTTGCT  
 CTGGTTTCTGTTCAATAAAAGTTTACTATGAATGACCTG

Human HERPUD1 mRNA sequence - var10 (public gi: 7661869) (SEQ ID NO: 86)

GACGTGAACGGTCGTTGAGAGATTGCGGGCGGCTGAGACGCCCTGCTGGCACCTAGGAGCGCAGCG  
 GAGCCCCGACACCGCCGCCGCCATGGAGTCCGAGACCGAACCCGAGCCGCTGGAGTGTGGCCACCTCAAGG  
 AGCCCCAACAGCGCACCGCGACTTGGAGCTGAGTGGCGACCGCGCTGGAGTGTGGCCACCTCAAGG  
 CCCACCTGAGCCCGCTCACCCCGAGCGTCCCGCTCAGAGGACCAAGAGGTTAATTATTCTGGGAAAGCT  
 GTGTTGGATCAAAATGTCAGGACTTCTCAAGGAAACGGCATGTTGCACTGGTGTG  
 TCAATGTGAAGAGTCCTCAAAATGCCAGAAATCAACGCCAAGGTGGCTGAATCCACAGAGGAGCCTG  
 CTGGTTCTAATGGGGACAGTATCTGAGGATTCTCAAGTGTGTTAAGGCAAAGGGAAAGTTCTCG  
 GAAACCTTCTCCCTGGATGGAAAACATCTCAAGGCTGAAGCTGCCAGCAGCATTCCAAGGCC  
 GGTCTGGTTCTCCGGTACACACCCATGGGTGGCTCAGCTTCTGGTCCAGCAGATATATGCAC  
 GACAGTACTACATGCAATATTAGCAGCCACTGCTGCATCAGGGCTTTGTTCCACCAAGTGCACA  
 AGAGATAACCTGTGGTCTGACCTGCTCCAGCCCTATTACAACCAAGTTCCAGCTGAAAACCAGCCT

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GCCAATCAGAATGCTGCTCAAGTGGTTAACTCTGGAGCCAATCAAATTGCGGATGAATGCAC  
AAGGTGGCCCTATTGTGGAAGAAGATGATGAAATAATCGAGATTGGGATTGGACCTATTCA  
GAGCAGCTACATTTCTGTTTCTCAGTATCCTACTTCTACTCCTCCCTGAGCAGATTCC  
CATGGTCATGGGGGCCACAGGGATGTAACAGGAAAGGCACTGATCC  
CAAATGATGGTCCCTCCCTGACGTTGAAATCAGGACCCCCAACAAATAACTTAC  
AGGAAGGCACTGATCC  
TGAAACTGAAGACCCCCAACACCTCCAGACAGGGATGTAAGATGGCAGCAGACCAG  
CCCCCTCC  
TTTATGAGCACAGCATGGCTTGTCTCAAGACTTCTTGCCTCTCTTCCAGAAG  
GGCCCCCAGCCA  
TCGCAAACACTGATGGTGTGCTGAGCTGGAGGCTTGACAGGAATGGACTGGAT  
CACCTGACTC  
CAGCTAGATTGCTCTCTGGACATGGCAATGATGAGTTTAAAAAACAGTGTGGAT  
GATGATGCTT  
TTGAGCAAGCAGAAAAGCAGAAAGTGAAGCGTGATACAAATTGGTGAAC  
AAAAATGCCAAGGCTTC  
TCATGTCATTCTGAAGAGCTTAATATATACCTATGAGTTAATAAGCACTG  
TAGTGAAGGCC  
TTAGGTGTTGATGCTATGCTGAGGAACCTTCAAATGTTGCTGCTGCATG  
TGTGTTGACATAG  
AAGTCATAGATGAGCAGAAGTGGTCTGCTGGTACGATTGATTCTGTTGA  
ATGTTAAATTACACTAAG  
TGTACTACTTATATAATCAATGAAATTGCTAGACATGTTAGCAGGACTTCT  
AGGAAGACTTATG  
TATAATTGCTTTAAAATGAGTGTACTTAAACTAAGGGGAACTTGC  
GGAGGTGAAAACCTTG  
CTGGGTTCTGTTCAATAAAGTTTACTATGAATGACCTGAAAAA  
AAAAAAAAAAAAA

Human HERPUD1 Protein sequence - var1 (public gi: 16507802) (SEQ ID NO: 249)  
MESETEPEPVTLVKS PNRQHDL ELSGDRGVSHLKAHSRVYPERPRPEDQRLIYSGKLLDHQCLR  
DLLPKERHVHLVCNVKSPSKMPEINAKVAESTEEPAGSNRGQYPEDSSDGLRQREVLRNLSSPGWEN  
ISRHVGVWFPFRPRPVQNFNDGPPPDVVNQDPNNNLQEGTDPETEDPNHLPPDRDVLDGEQTSPSF  
MST  
AWLVFKTFFASLLPEGPPAIAN

Human HERPUD1 Protein sequence - var2 (public gi: 10441911) (SEQ ID NO: 250)  
MQYLAATAASGAFVPPPSAQEI PVVSAPAPAPIHNOFPQAENQ PANQNAAPQVVVNPG  
ANQNL RLMNAQGGP  
IVEEDDEINRDWLDWTYSAATFSVFLSILYFYSSLRFLVMVGATVVMYLHHVGWFPFRPRPVQNFNDG  
PPP  
DVNVQDPNNNLQEGTDPETEDPNHLPPDRDVLDGEQTSPSF  
MSTAWLVFKTFFASLLPEGPPAIAN

Human HERPUD1 Protein sequence - var3 (public gi: 3005723) (SEQ ID NO: 251)  
GHKAHL SRVYPERPRPEDQRLIYSGKLLDHQCLR DLPKEKRHVHLVCNVKSPSKMPEINAKVAEST  
EEPAGSNRGQYPEDSSDGLRQREVLRNLSSPGWEN ISRPEAAQQAFQGLGPFGSYTPY  
GWQLQLSWFOO  
IYARQYYMQYLAATAASGAFVPPPSAQEI PVVSAPAPAPIHNOFPQAENQ PANQNAAPQVVVNPG  
ANQNL RLMNAQGGP  
IVEEDDEINRDWLDWTYSAATFSVFLSILYFYSSLRFLVMVGATVVMYLHHVGWFPFRPRPV  
QNFNDGPPPDVVNQDPNNNLQEGTDPETEDPNHL  
PPDRDVLDGEQTSPSF  
MSTAWLVFKTFFASLLPEG  
PPAIAN

Human HERPUD1 Protein sequence - var4 (public gi: 7661870) (SEQ ID NO: 252)  
MESETEPEPVTLVKS PNRQHDL ELSGDRGVSHLKAHSRVYPERPRPEDQRLIYSGKLLDHQCLR  
DLLPKERHVHLVCNVKSPSKMPEINAKVAESTEEPAGSNRGQYPEDSSDGLRQREVLRNLSSPGWE  
NISRPEAAQQAFQGLGPFGSYTPY  
GWQLQLSWFOO IYARQYYMQYLAATAASGAFVPPPSAQEI PVVSAP  
APAPIHNOFPQAENQ PANQNAAPQVVVNPG  
ANQNL RLMNAQGGP  
IVEEDDEINRDWLDWTYSAATFSVFLSILYFYSSLRFLVMVGATVVMYLHHVGWFPFRPRPV  
LYFYSSLRFLVMVGATVVMYLHHVGWFPFRPRPVQNFNDGPPPDVVNQDPNNNLQEGTD  
PETEDPNHL  
PPDRDVLDGEQTSPSF  
MSTAWLVFKTFFASLLPEGPPAIAN

Unigene Name: HLA-A Unigene ID: Hs.181244 Clone ID: GD\_159

Human HLA-A mRNA sequence - var1 (public gi: 575248) (SEQ ID NO: 87)  
ATGGCCGTCATGGCGCCCCGAACCCCTCGTCTGCTACTCTCGGGGGCTCTGGCCCTGACCCAGACCTGG  
CGGGCTCTCACTCCATGAGGTATTCTTACATCCGTGTCGGCCCGCCGCGGGAGCCCCGCTTC  
CGCAGTGGCTACGTGGACGACACCGCAGTCTGTCGCGGTTCGACAGCGACGCCGCGAGCCAGAGGATGGAG  
CCGGGGCGCCGTGGATAGAGCAGGAGGGTCCGGAGTATTGGGACGGGGAGACACGGAAAGTGAAGGCC  
ACTCACAGACTCACCGAGTGGACCTGGGGACCCCTGCGCGGCTACTACAAC  
CAGAGCGAGGCCGGTTCTCA  
CACC GTCCAGAGGATGTATGGCTCGACGTGGGGTCCGACTGGCGCTTCC  
CTCGGGGTACCA  
CAGCAGCTACGAGGATTACATGCCCTGAAAGAGGACCTGCGCTCTTG  
GACCGCGGGACATGGCAG  
CTCAGACCAAGCACAAGTGGAGGCGCCCATGTGGCGGAGCAGTTGAGAG  
CCTACCTGGAGGGCGA  
GTGCAGTGGAGTGGCTCCGAGATACTGGAGAACGGGAAGGAGC  
GCTGCAGCGACGGACGCC  
ACCGATATGACTCACCA  
CGCTCTGACCATGAAGCCACCC  
CTGAGGTGCTGGCCCTGAGCTTCTACC

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CTGGGAGATCACACTGACCTGGCAGCGGGATGGGGAGGACCAGACCCAGGACACGGAGCTCGTGGAGAC  
CAGGCCTGCAGGGATGGAACCTTCAGAAGTGGCGGTGTTGCTCTGGACAGGAGCAGAGA  
TACACCTGCCATGTGAGGGTTGCCAAGCCCCCTACCCCTGAGATGGAGCCGCTTCCCAGC  
CCACCATCCCCATCGTGGCATATTGCTGGCTGGTTCTTTGAGCTGTGATCACTGGAGCTGTGGT  
CGCTGCTGTGATGTGGAGGAGAAGAGCTCAGATAGAAAAGGAGGGAGCTACTCTCAGGCTGCAAGCAGT  
GACAGTGCCCAGGGCTCTGATGTCTCACAGCTTGAAAGTGTGA

Human HLA-A mRNA sequence - var2 (public gi: 187857) (SEQ ID NO: 88)  
ATGGCCGTATGGCGCCCCGAACCTCGTCTGCTACTCTGGGGGCCCTGGCCCTGACCCAGACCTGGG  
CGGGCTCCCACCTCCATGAGGTATTCTACACTTCCGTGTCGGCCGGCCGGAGCCCCGCTTCAT  
CGCGTGGCTACGTGGACGACACCCAGTTCGTGGCTCGACAGCGACGCCGAGCCAGAGGATGGAG  
CCGGGGCGCCGTGGATAGAGCAGGGAGGGCCGGAGTATTGGGACCGAACACACGGAATGTGAAGGCC  
AGTCACAGACTGACCGAGTGGACCTGGGACCCCTGGCGGGCTACTACAACCAAGAGCGAGGCCGGTCTCA  
CACCATCCAGATGATGTATGGCTGGCGACGTGGGCGCTTCCTCCGCGGGTACCGGCAGGAC  
GCCTACGACGGCAAGGATTACATGCCCTGAAAGAGGACCTGCGCTCTGGGACCGCGGGAGCATGGCAG  
CTCAGACCACCAAGCACAAGTGGGAGGCCCATGTGGCGGAGCAGTGGAGAGCCTACCTGGAGGGCAC  
GTGGTGGAGTGGCTCCGAGATACTGGAGAACGGGAAGGAGACGCTGCAGCGCACGGACGCCAAAA  
ACGCATATGACTCACCACGCTGCTCTGACCATGAAGCCACCCCTGAGGTGCTGGGCCCTGAGCTCTACC  
CTGCGGAGATCACACTGACCTGGCAGCGGGATGGGGAGGACCGACACCCAGGACACGGAGCTGTGGAGAC  
CAGGCCTGCAGGGATGGAACCTCCAGAAGTGGGTGGCTGGTGCCTCTGGACAGGAGCAGAGA  
TACACCTGCCATGTGAGCATGAGGGTTGCCAAGCCCCCTACCCCTGAGATGGGAGCCGTCTCCAGC  
CCACCATCCCCATCGTGGCATATTGCTGGCTGGTTCTCTGGAGCTGTGATCACTGGAGCTGTGGT  
CGCTGCTGTGATGTGGAGGAGAAGAGCTCAGATAGAAAAGGAGGGAGCTACTCTCAGGCTGCAAGCAGT  
GACAGTGCCCAGGGCTCTGATGTCTCACAGCTTGAAAGTGTGA

Human HLA-A protein sequence - var1 (public gi: 575249) (SEQ ID NO: 253)  
MAVMAPRTLVLSSGALALTQTWAGSHSMRYFFTSVSRPGRGEPRFIAVGYVDDTQFVRFDSDAASQRME  
PRAPWIEQEGPEYWDGETRKVKWAHSQTHRVDLGLRLRGYYNQSEAGSHTVQRMYGCDVGSWRFLRGYHQY  
AYDGKDYIALKEDLRSWTAADMAAQTTHKWEAHVAEQLRAYLEGECEVWLRRYLENGKETLQRTDAPK  
THMTHAVSDHEATLRCWALSFYPABEITLTWQRDGEDQTQDTELVETRPAGDGTFQKWAADVPSGQEQR  
YTCHVQHEGLPKPLTLRWEPSOPTIPIVGIAGLVLFGAVITGAVVAAMWRRKSSDRKGGSYSQAASS  
DSAQGSDVSLTACKV

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Unigene Name: HLA-B Unigene ID: Hs.77961 Clone ID: 3GD\_1122

Human HLA-B mRNA sequence - var1 (public gi: 32188) (SEQ ID NO: 89)  
ATGGGGTCACGGCCCCGAACCGTCTCTGCTCTCGGGAGCCCTGGCCCTGACCGAGACCTGGG  
CCGGCTCCCACCTCATGAGGTATTCTACACCGCCATGTCCCGGCCGGCCGGGGAGCCCCGCTTCAT  
CTCAGTGGGCTACGTGGACAGCACGCAGTTCGTGAGGTTGACAGCAGCAGCGAGTCAGAGAGAGAG  
CCGGGGCGCCGTGGATAGAGCAGGGGCCGGAGTATTGGGACCGGGAGACACAGATCTCCAAGACCA  
ACACACAGACTTACCGAGAGAGCCTGCGAACCTGCGGGCTACTACAACCAGAGCGAGGCCGGTCTCA  
CACCTCCAGAGGATGTACGGCTGCGACGTGGGGCCGGACGGGGCCCTCTCCGCGGGCATGACCGAGTCC  
GCCTACGACGGCAAGGATTACATGCCCTGAAACGAGGACCTGAGCTCTGGACCGCGGGACACGGCGG  
CTCAGATCACCCAGCGCAAGTGGGAGGCCGGCTGAGGCGGAGCAGCTGAGAGCCTACCTGGAGGGCCT  
GTGCGTGGAGTGGCTCCGAGATACTGGAGAACGGGAAGGGAGACGCTGAGCGCGGACCCCCCAAAG  
ACACATGTGACCCACCAACCCATCTGACCATGAGGCCACCCCTGAGGTGCTGGGCCCTGGCTTCTACC  
CTGCGGAGATCACACTGACCTGGCAGCGGGATGGCGAGGACCAAACACTCAGGACACCGAGCTTGTGGAGAC  
CAGACCAGCAGGAGATAAACCTTCCAGAAGTGGGAGCTGTGGTGGCTTCTGGAGAACAGCAGAGA  
TACACATGCCATGTACAGCATGAGGGCTGCCGAAGCCCTCACCTGAGATGGGAGGCATCTCCAGT  
CCACCATCCCCATCGTGGCATTGTTGCTGGCTGGCTTAGCAGTTGTGGTCACTGGAGCTGTGGT  
CGCTACTGTGATGTGAGGAGGAAGAGCTCAGGTGGAAAAGGAGGGAGCTACTCTCAGGCTGCGTCCAGC  
GACAGTGCCAGGGCTCTGATGTCTCACAGCTGA

Human HLA-B protein sequence - var1 (public gi: 32189) (SEQ ID NO: 254)  
MRVTAPRTVLLLSGALALTETWAGSHSMRYFYTAMSRPGRGEPRFISVGYVDDTQFVRFDSDAASPREE  
PRAPWIEQEPEYDRETOISKNTQTYRESLRNLRGYYNQSEAGSHTLQRMYGCDVGPDRLLRQHDQS  
AYDGKDYLALNEDLSSWTAADTAQITORKWEAAREAEQLRAYLEGLCVEWLRRYLENGKETLQRADPPK  
'THVTHHPISDHEATLRCWALGFYPAEITLTWQRDGEDQTQDTELVE TRPAGDRTFQKWAAVVPSGEEQR  
YTCHVQHEGLPKPLTLRWEPSQSTIPIVGIAGLAVLVIGAVVATVMRRKSSGGKGGSYSQAASS  
DSAQGSDVSLTA

Unigene Name: MSTP028 Unigene ID: Hs.302746 Clone ID: GD\_1119

Human MSTP028 mRNA sequence - var1 (public gi: 14042294) (SEQ ID NO: 90)  
CCCCGCCTCCGCCCCCGCTGGCGTAGCTGGGTGTTCTGCCTCTCTCAGTCCGGTTGGAGACTCC  
TGGCTCTCCGACTTTCTGGAAAGAGATGTAGCTGGAGAAAGTGTGGTGGAGCTCAGCGGTGCCAGCGGCTG  
CTACCCGCACCACTTCTCTCAAGGGCACGAGCCCAGCTCAAATACGTAAAGCTGAATGTGGTGGAGC  
CCTACTATACCAACATGAGACGCTGACCAAGCAGGACACCATGCTGAAGGCCATGTTAGCGGGCG  
ATGGAAGTGTGACCGACAGTGAAGGCTGGATCCTCATTGACCGCTGTGGAGACACTTGGTACGATA  
TCAACTACCTCGAGACGGGGCGGTGCTTTACCGAGAGCCGGGGAGATCGAGGAGCTGCTAGCAGA  
AGCCAAGTACTACCTAGTCAAGGCTGGTGGAGAGTGCCAGGGGGCTACAAACAAAGATACTTAT  
GAGCCTTCTGCAAGGTCCCTGTGATCACCTCATCCAAGGAAGAACAAAAACTTATAGCGACTTCAAATA  
AGCCAGCCGTGAAGTTGCTCTACAACAGAAGTAACAACAAATACTCATATACCAAGCAATTCTGACGACAA  
TATGTTAAAAACATTGAACGTGTTGATAAGCTGTCTCTGCGCTTTAACCGAAGGGTCTGTTCTATAAAG  
GATGTTATTGGGATGAAATCTGCTGCTGGTCTTTATGGTCAGGGCCGGAGATGCTGAAGTCTGTT  
GTACCTCCATCGTCTATGCCACTGAGAAGAAACAGACCAAGGTGGAGTTTCCGAAGCCGGGATTTATGA  
GGAGACCTGAACATTGCTGTATGAGGGCCAGGTGGCCGGGGGACCTGACAATGCGCTCTGGAGGCC  
ACAGGGGGGGGGGGGGGGGGCTCCACACCTGGAGGAGGAGCAGGGAGCGGAGCGGATCGAGCGCGTGC  
GGAGGATCCACATCAAGCGCCCTGATGACCGGGCCACCTCCACAGTGAGCAGGCAAGAGACCGAGCG  
CCCTCCTCTCACCGCCCCCACTCCCTGCCGTGCTACACCCAGATCCTGTGCAAGGCTGCCGGGCCCCCT  
GCTTCCCTTGAGGCTGGAGATACTTTGTAACAAGCCAGATGATTATTTGGTATTGCTTGACAAGGCA  
AATTGATTGTTGACCCAGGCTATGACCCCTGCGTTGAACAAGCTGTGCTAAAGATCTACTTTTC  
ATGAGAATCTGAGACTCTTGGAGGCCAGGCTTCTCGGGTCTCAGAGGAAAGTATGAATGAGTGTGAAG  
TGTATGTGAGAACTTTGTTGCAATATTATTGTTGTTGCTGGCTTCTATGTGGCTTTGGGT  
GACACTCCCTTAAGGGTTCAGTTGACAATTCTGAGAGTTGCTCTGCAAGTGGAGGCCACAGAGGTATC  
TGAGCTCCCTGCTTCTATTCTATACTCCTCCAGCCCCAGGCTTCACTCTGGTTCTGTGTTGG  
CCCGGGCACATCCCCACTGCTTGTAGACGTCTTGTGCCATGTGGCTTGGGCCAGAGCTTGTG  
ATAATTGCAAGGCTTGTGGCAGGGAAATATGGCTGAATGAGCGTCAAATCTGTTGAGACCCAGTGC  
GGGTGCAAGGCTTGTGGTCAAGGCTTGTGGCCACCTGGCTGGTCTTGGCTGGTGTCACTG  
GGACCCCCATATGTCTGCCAGGAGCAGAACCTTCCATGGCAAGTGTCCAGCTCTGTTCTGGTCT  
TCCCCAACTCCAGCCCCGTCCAGTTGTTCTCTGATTGACCCGACTCCACTCCAGGAAGGCCATCTGACC

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CTGTGACAGGCATAGCTATAAACTACCCCTCCCTGGATCCCGCTCCTTCAGCCTCCTTCCCCATGA  
AGCTGGGCTAACCTTCTAAGTCATTGCTTAGAAATTCAAGTGTGGCCCATACCCCTTGCTATAAACACAGACCCCC  
TGGCATCCAGGCAGGGACACCCCTCACACCACAGCCCCAGGGAGCTCCCTGCTATAAACACAGACCCCC  
TTGCTTTGCCCTCTGATTTTACACAGTGTAGAGTGGCCAGCAGTGAACAGGTTGAGGATGTGGGGTAG  
ATAGATAACTTGGGCTGGTTGTCTGTTCATGTTGTTAAGGGATATGTGTGACTGTGGGTGG  
GGACGTGTGCTTGTGGGGCACAGGTGGCGGCCCTGCTGGAGCCCGCTGGCGCAGCCCTATGTAGGA  
CGGGTCTCAGTGCACCTCCCAGGCTCTGCACCTGCAAAGGAACAGGAGTGAGTCGTGACTG  
ACAGGGGTGGTAGACTAGACTAGGTAGTAGTACCCAGGAGATGTGAATGTGCGTCAGGTGATGGAT  
GGGTTGTCAGGAAATCGTTACCGTTATACCAAAGGTATTAACATGGCAGCCTTGACACATGTAT  
TCCAAAACGAGTTATTTCAACGGTTTACAGCTAGACTTGTACTTACTGCCCTGCCGTG  
CAGTTGTATGCCCTCATTTGTATCCAACAGCAAAGTCTACAATAAAACTTTAAACATCATG  
CAGTTGTATGCCCTCATTTGTATCCAACAGCAAAGTCTACAATAAAACTTTAAACATCATG

Human MSTP028 mRNA sequence - var2 (public gi: 13994352) (SEQ ID NO: 91)  
GGAGACTCCTGCGTCTCCGACTTTCATGGAAGAGATGTCAAGGAGAAAGTGTGGTGGCTCAGGGTGC  
CAGCGCTGCTACCGCACCACTCCTCAAGGGCACGAGCCCCAGCTCAAATACGTGAAGCTGAATGT  
GGGGAGGCCCTCTACTATACCAACCATGCAGACGCTGACCAAGCAGGACACCAGTGAAGGCCATGTT  
AGCGGCGCATGGAAAGTGTCAACCGACAGTGAAGGCTGGATCCTCATTGACCGCTGTGGAAAGCACTTT  
GTACGATACTCAACTACCTCGAGACGGGGCGGTGCTTACCCGAGAGCCGCCGGAGATCGAGGAGCT  
GCTAGCAGAAGCCAAGTACTACCTAGTCCAAGGCTGGTGAAGAGTGCAGGCGGCCCTACAAAACAAA  
GATACTTATGAGCCTTCTGCAAGGCTCCCTGTGATCACCTCATCCAAGGAAACAACAAACTTATAGCGA  
CTTCAAATAAGCAGCGTGAAGTGTCTACAAACAGAAGTAACAACAAACTCATATACCAGCAATT  
TGACGACAATATGTGAAAAAACATTGAACTGTTGATAAGCTGTCTGCGCTTAAACGGAAGGGTCTG  
TTCATAAAGGATGTTATGGGGATGAAATCTGCTGCTGGCTTTTATGGTCAGGGCCGGAAAGATTGCTG  
AAGTCTGTTGACCTCCATCGTCTATGCCACTGAGAAGAACAGACCAAGGTGGAGTTCCCGAAGCCCG  
GATTATGAGGAGACCCCTGAAACATTGCTGATGAGGCCAGGATGGCCGGGGACCTGACAATGCGCTC  
CTGAGGCCACAGGGGGGGCGCTCCCACCACTGGACGAGGACGAGGAGCGGGAGCGGATCG  
AGCGCGTGCAGGAGATCCACATCAAGGCCCTGATGACCGGCCACCTCACAGTGAAGCAGGAAAGAG  
ACCGAGCCGGCTCCTCTACCGCCCCACTCCCTGCCGTGCTACACCCAGATCTGTGAGGCTGCCGG  
GCCCTCTGCTTCCCTGGAGCCTGAGATACTTTGTAACAAGCCAGATGATTATTTGGTATTGCTT  
GACAAGGCAAATTGATTGCTTGAACCAAGGCGTATGACCCCTGTCGTTGAAACAAGCTGTGCTAAGATCT  
CTACTTTCATGAGAATCTGAGACTTTGGAGCCAGGCTTCTCGGTTCTCAGAGGAAAAGTATGAATG  
AGTGTGAAGTGTATGTGAGAACTTTGTTGCAATATTATTGTTGTTGTCGACTTCTATGTGGG  
TTTTGGGTGACACTCCCTTAAGGGTCAGTTGACAATTCTGAGAGTTGCTCTGCACTTGGAGGCCACC  
AGAGGTATCTGAGCTCCCTGCTTCTATTCTATAATCTCCAGGCCAGCTCCACTCTGGTCT  
TGTGTTGGCCGGGACAACATCCCTGCTGAGACGCTTCTGCAATGTCGTTGGCTTGGCCTAG  
AGCTTGTGATAATTGAGCTTGTGGCAGTGGAAATATGGCTGAATGAGCTCTAAATGTTGAGACCAG  
TGCAACATTGGGTGCAAGGCTTTGTTAGGGATCAAGCCTTTGCCACCTTGGCTGGCTTGGCCTGG  
TGCTCACTGGGACCCCATATGCTCGCTAGGAGCAGAACCTCCATGGCAGTAAGTGTCCAGCTGTT  
CTGTTCTTCCCAACTCCAGCCCCGTCAGTTGTTCTCTGATTGACCCGACTCCACTCAGGAAGGC  
CATCTGACCCCTGTGACAGGCATAGCTATAAAACTACCCCTCCCTGGGATCCCGCTCTCAGCCTCCT  
TCCCCATGAAGCTGGCTAACCTTCTAAGTCATTGCTTAGAAATTCACTGTGGCCATACCCCTTG  
CTCCCAAGCCTGGCATCCAGGCAGGGACACCCCTCACACCACAGCCCCAGGGAGCTCCCTGCTATAAAC  
CAGACCCCCCTGTCCTTGGCTCTGATTTTACACAGTGTAGAGTGGCCAGCAGTGAACAGGTTGAGGATG  
TGGGGTAGATAGATAACTTGGGCTGGTTCTGTTCTGTCGTTCATGTTGTTAAGGGATATGTGTGAC  
TATGTTAGGACGGGTGTTCTCAGTGCACCTACCTCCAGGCTCTGTCACCTGCAAAGGAACAGGAGTGAG  
TCGTGACTGACAGGGGTGTTGAGACTAGACTAGGTAGAGTGTACCCAGGAGATGTGAATGTGCGTCAG  
GTGAGATGGGTTTGTCAAGGGAAATGTTACCGTTTATACCAAAGGTATTAACATGGCAGCCTTGA  
CACATGTTTCCAAAAACGAGTTATTTCAACGGTTTACAGCTAGACTTGTACTTACTGCC  
TGCTGTGACAGTTGATGCCCTCATTTGTATCCAACAGCAAAGTCTACAATAAAACTTTAAACATC  
ATGAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Human MSTP028 mRNA sequence - var3 (public gi: 25303941) (SEQ ID NO: 92)  
CCGGGTTGGAGACTCCTGCGTCTCCGACTTTCATGGAAGAGATGTCAAGGAGAAAGTGTGGTGGCTC  
AGCGGTGCCAGCGCTGCTACCCGACCACTTCCCTCAAGGGCACGAGCCCCAGCTCAAATACGTGAAG  
CTGAATGTGGGTGGAGCCCTACTATACCAACCATGCAGACGCTGACCAAGCAGGACACCAGTGAAG  
CCATGTTCAGGGGGCGCATGGAAAGTGTCTACCGACAGTGAAGGCTGGATCCTCATGACCGCTGTGGAA  
GCACCTTGGTACGATACTCAACTACCTCGAGACGGGGCGGTGCCCTTACCGAGAGCCGCCGGAGATC  
GAGGAGCTGCTAGCAGAAGCCAAGTACTACCTAGTCCAAGGCCCTGGGAAGAGTGCAGGCCAGGCC  
AAAACAAAGATACTTATGAGCCTTCTGCAAGGTCCCTGTGATCACCTCATCCAAGGAAGAACAA  
TATAGCGACTTCAAAATAAGCCAGCCGTGAAGTTGCTCTACAACAGAAGTAACAACAAACTCATATACC  
AGCAATTCTGACGACAATATGTTGAAAAACATTGAACAGCTGATAAGCTGTCTGCGCTTTAACGGAA

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GGGCTCTGTTCATAAAGGATGTCATTGGGGATGAAATCGCTGCTGGTCTTTATGGTCAGGGCCGGA  
GATTGCTGAAGTCTGTTGACCTCCATCGCTATGCCACTGAGAACAAACAGACCAAGGTGGAGTTTCCC  
GAAGCCCCGATTATGAGGAGACCCCTGAACATTGCTATGAGGCCAGGATGGCCGGGACCTGACA  
ATGCGCTCTGGAGGCCACAGGGGGCGGGGGCCTCCACCTGGACGAGGACGGAGCAGGG  
GCGGATCGAGCGCTGCGGAGGATCCACATCAAGGCCCTGATGACGGGCCACCTCCACAGTGAGCA  
GGCAAGAGACCAGGCCCTCCTCACGCCACTCCCTGCCGCTACACCCAGATCTGTGCA  
GCTGCCGGCCCTCTGCTTCCCTGGAGGCTGGAGATACTTTGTAACAGGAGATGATTATTTGG  
TATTGCTGACAAGGCAAATTGATTGCTTGACCCAGGCTATGACCCCTGCTGTTGAACAAGCTGTGTC  
TAAGATCTACTTTCATGAGAACATGAGACTTTGGAGGCCAGGCTTCTCGGTTCTCAGAGGAAAAG  
TATGAATGAGTGTGAAGTGTAGAGACTTTGGTCAATATTATTTGTTGGGTGTCAGTCT  
ATGTTGGCTTTGGGTGACACTCCCTAAAGGTTCAAGGTTCAAGGTTGACAATTCTGAGAGTTGTCAGTGG  
AGGCCAACAGAGTATCTGAGCTCCCTGCTCCATTTCATAATCCTCAGGCCAGCAGGTCCACTCCT  
GGTTCTGTGTTGGCCGGCACAATCCCCACTGCTTGCTAGACGTGTTCTGCCATGTGGCTT  
GGGCTAGAGCTTGTGATAATTGAGCTTGTGGCAGTGGAAATATGGCTGAATGAGTGTCAAATCGTT  
GAGACAGTCAACTTGGGTGCAAGGCTTGTGTTAGGGATCAAGGCTTTGCCACCTGGCTGGTCTT  
TGGCCTGGTCTCACTGGGACCCATATGTCGCTAGGAGCAGAACTTCCATGCCAGTAAGTGTCCAG  
CTCTGTTCTGGTTCTTCCCAACTCAGCCCCGTCAGTTGTTCTCTGATTGACCCGACTCCACTCC  
AGGAAGGCCATCTGACCCCTGTGACAGGCATAGCTCAAACACTACCCCTCCCTGGGATCCCCTCCTC  
AGCCTCTTCCCCATGAAGGCTGGCTAACTTCTAAGTCATTGCTTAGAAATTCACTGTTGGCCCATAC  
CTTGTCTCTCCAGCCTGGCATCCAGGCAGGCCACCCCTCACACCCAGGCCAGGGAGCTTCCCTG  
TATAAACACAGACCCCTGTCTTGGCTGCTGTTACACAGTGTAGGGATGACCTGGCAGCAGTGAACAGGT  
TGAGGATGTGGGGTAGATAGATAACTTGGGTCTGGTTGTCTGTGTTCACTGTTAAAGGGATG  
TGTGACTGTGGGGTAGGGGAGCTGTGCTTGGGGCACAGGTGGCCCTGCTGGAGGCCGGCTGGCGCAGC  
GCCTATGTTAGGACGGGTGTTCTAGTGCACCTACCTCCAGGCTCTGCACTGCAAAGAACAGGAGT  
GAGCTGACTGACAGGGGTGGTTGAGACTAGACTAGGGTAGTTACAGGAGATGTGAATGTGCGT  
CAGGTGATGGATGGTTGTCAAGGAACTGTTACCGTTTATACCAAAGGTATTAAACATGGCAGCCTT  
TGACACATGATTCAAAACAGGTTTATTTCAAAACGGTTTACAGCTTAGACTTTGTACTTACTG  
CCCTGCTGTGACAGTGTATGCTTCAAGGTTGCTATCCAAACAGCAAGCTCAAACAAACTTAAACA  
ATCATGACTGAATGTCAAATCGTGTATTGGCAGATGCTTTAAACTGTCGTGAGAAACTTTTATA  
TTAGGCATTGGATTTTATAAGGCTAAAGGAGGGCTTACAAATGTTCTGCTAAATTTTATA  
TGTTTAAGTGTAAACACCAACCCCTGCTTCTTGGGTTGAGCTTTTAAAGGTTGCTCTATTGGCCAGGC  
TGGCCAGGAAATGGAAAAGCATTGCTATAAATTGTTTGGAGGCTGGAGTCTTGTCTATTGGCCAGGC  
TGGAGTTGAGTGGCACCCTCCACTTACCAACTTGTGCTCTGGGTTCAAGGCAATTCTGCTGCTC  
AGCCTCCGAGTAGCTGGGATTGCAAGGTACCCATGCCAGCTAAATTGTTACAGGAGATGAG  
GATGGGGTTTACCATGTTGGCAGGCTGGTCTGAACTCTGACCCCTGTGATCCGACCACTTGGCTC  
CCAAAGTGTGGGATTACAGGTGTGAGTCACCAACCTGGCTCATGTTAAATGTTGTGTGAAG  
AATGAGTTGTGGAACAATTGATTTGCTGTTGGCCTCTATGCCAAATGAGCTAGTGTGTTCTGGCAGCT  
CTCTACCCAACCTTGCACTTGTAGTTTGAGTCTTGTCTCTGGAATATGAAACAGGTTATAAAACAT  
TCCATGGTGAACAATTCTGTCGGCTGCATTAGCCATGAGTGAATAGACGATTGGCTGGCCAAGCT  
CTGTTATTGAGTATACAAGGAACAGTGTGTTCTGTTAGCACTAAGGGCAAAACAAATTATATA  
GTAAGCACTATCCAGGTAACACTGGCCAAGGTTGGTAAAGGAGATTCTGCAATGTAATAACTAC  
AGTTTTTACAATTGGAACAGCTTGGGAGCTGGTCTGTAATGCCAAAGGTTTGTGTTGTTGTTCAAA  
AAGCCATCTGATTGGTGTGACTGGGGCCATGCTGAGCAACATTCTGGCATATTCTGTCACCCCTCCG  
GGGGCGACTCTGTTGGGAGCCCCATTCCCAAGTTAAAGTGTGCTCTGTAACCTTACAACAGCGATTCA  
GGACCCAAGTGTGAACACACTCAGGCCCTCTGAGCGTGTGCTTTAGGGCTACCCAAAGT  
CACTGTAACAGTTAAGTGTGTCATTAACTTCTGTCATTGCGCCATAAAAAAAAGTCTCAAAGTTA  
GATGTAGCCACTGTATGTTGACAAACGTTGGCAGTGTAAATAAAAGTCTAAAATGCAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Human MSTP028 mRNA sequence - var4 (public gi: 16552440) (SEQ ID NO: 93)  
AGTCCGGGTTGGAGACTCCTCGCTCTCCGACTTTCATGGGCCCTGACATGGCAGGTGATATCCAGGA  
CACTGTTGGTGCATGGAGTTGGGAGAGTTGGCCAGAAGAGTTGGATAACCTGAAATTGAATATTGTC  
CATGACTGTCGGCTGCTCTGCTGCAAGCTGCCCTTAACCTCCAGTCCCATTACAAAAATAA  
CGCTTGTTTACAGTTAGTTGAGTACCCATTCAATTAGAAAATCTGAAAACCTAGACAATT  
TTTTCAAGTTCAAGGAATAGTTCAAACAAGTTATGTGCTGTCAGTGCCCTGAGCCAAAAGCACGAGG  
AGCATAACCTGAGTCAAGCAAAGTTGGGTTATTCCCTGTCAGTGGGTTGGGAAGAACGTGAGGAC  
ATCTCAGAGAAGGGCTGGGCTTGTGTTGGTATTGAGAGACAGTTCAAGAGAAGTGGGCTTGTCT  
TGTGTTGGATGCTGCTGGGAAGCAGGGCTAATTCTGATTGGGCTCAGTGATTCCCTGACTTGAAAGCA  
GGAAGAAATGGAAGGAGGCTAAACTCTCATGGTAAAGCAGCAGCTGAACCTCTATTAGCCAGGATAGG  
GGATCTTGGTCATTTGTATTTGGATAATGTTATGTTTGTCTGTCAGGACATGATGACTGAA  
TGGTCCTGTTTGTCTTGTGCAAGGGCACAGAGTGGCCTGTCAGGGTATGTCAGGAAACT  
GTTGATGTTCAATGGAATGGTAGGGCCAGCCGTGGGGCTACCCAGATTCAAGAAAGATTCTGCCAAC  
CTTGCACATTCCACCTACAGTTACCTGTCATTCAAGACATGTTGCTGAGTACACATGTGC

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CGGATACCAATCTCACTTCCAGGCCCTGCGTAATCAGCCACTGTATCCATTCTTGAGATGTACAGAG  
 AGTCAGCCATGCTATCAGGGAGATGGTAGTGGGATCTGCTTTGGGAGCACTAGTCTAGGAGGTCT  
 AATTGCAATAACTTGGTCCAAAAGTTCCATGTCTGTTAGTCCTCAGAAACACCTTCTCCCTA  
 CAGGAAGTGATAGGAGTGCAGCTGGATCCCATTCAACTTCATAAAGCTTATTCATCTGTGATGCAGC  
 TGAAAAATGACACTTAGCTAGCTATTGAGTGGTACATGGCAATAAGGAATGAAAGAGACCTGGGAGT  
 GCTTCTAGGCTGTTAGGGTCAGCCAGGGTGTCTAGTATACAGGTGCTAGGCAGAAAGGAAGTGCTTA  
 TAACACAAGAGTTAGGGCACCCCTGTGCTGAGGGTCAGGCAGGGTCACTGTTAGGGCTATCCAAACCCCAGCTTGACC  
 GGTGGGTCTTGGGACAAACTAGGGGATGCATGGGCCCTCTCTAGGGGTCATCCAAACCCCAGCTTGACC  
 AGTGTCTCCCTGCTAGGCCAGTTAGGGCTCTGATTTAGGAGAACAGCAGTCCAGATTTCTGTGAG  
 CTCTCCCTAGTGTGACCAATTGGAACAAACTTTAAATGCTGTATGCTGGCCAAAGCAAACACAT  
 CTGGAGGCCAGATTGAATCCACAGGCTGAAAGCAGTCACCCAGGCTGATGTCATGACCTGTATCCCT  
 CCACGGCAGGAAGAGATGTCAGGAGAACAGTGTGGTGAGCTCAGCGGTGCCAGCGGTGCTACCCGCACC  
 ACTTCCTCAAGGGCACGAGCCCAGTCACAGTGAAGCTGAATGTGGTGAGGCCCTACTATA  
 CCACCATGCAGACGCTGACCAAGCAGGACACCATGCTGAAGGCATGTTGACGGGCGATGGAAGTGCT  
 CACCGACAGTGAAGGCTGGATCCTCATTGACCGCTGTTGGGAAGCAGCTTGGTACGATACTCAACTACCTT  
 CGAGACGGGGCGGTGCTTACCCAGGAGCCGGAGATCGAGGAGCTGCTAGCAGAAGCCAAGTACT  
 ACCTAGTCAAGGCCTGGTGGAAAGAGTGCAGGCGGCCCTACAACAGAACAAAGATACTTATGAGCCTT  
 CTGCAAGGTCCTGTGATCACCTCATCAAGGAAGAACAAACTTATAGCGACTTCAAATAAGCCAGCC  
 GTGAAGTTGCTTACAACAGAACAGTAACAACAAACTCATATAACCAGCAATTCTGACGACAATAATGTTGA  
 AAAACATTGAACAGTGTGATAAGCTGCTCTGCGCTTTAACCGAAGGGCTCTGTTCAAAGGATGTCAT  
 TGGGGATGAAATCTGCTGCTGTTCTTATGGTCAAGGGCGGAAGATTGCTGAAGTCTGTTGACCTCC  
 ATCGTCTATGCCACTGAGAACAGAACAGCCAAGGTGGAGTTCCAGGCGGATTATGAGGAGACCC  
 TGAACATTTGCTGTATGAGGCCAGGATGGCGGGGACCTGACAATGCGCTCTGGAGGCCACAGGCG  
 GGGGGGGGGCGCTCCACCTGGACGAGGACGAGGAGCGGGAGCGGATCGAGCGCGTGGAGGATC  
 CACATCAAGCGCCCTGATGACCGGGCCACCTCACCAGTGAAGCAGGCAAGAGACCGAGCCGCCCTC  
 TCACCGCCCCCACTCCCTGCGTGCTACACCCAGATCTGTGCAAGGCTGCCGGGCCCTCTGCTTCC  
 TGGAGCCTGGAGATACTTTGTAACAAGCCAGATGATTATTTGGTATTGCTTGAACAGGAAATTGATT  
 GTCTTGACCCAGCGTATGACCCCTGCGTTGACAAGCTGTGCTAAGATCTACTTTCATGAGAAT  
 CTGAGACTCTTGGAGCCAGGCTTCTCGGTTCTAGAGGAAAGTATGAATGAGTGTGAAGTGTATGTG

Human MSTP028 mRNA sequence - var5 (public gi: 21750697) (SEQ ID NO: 94)  
 GCTGGCGTGAGCTGGGTGTTCTGCTCTCTCAGTCGGGTTGGAGACTCTCGCTCTCCGACTTTT  
 CATGGAAGAGATGTCAGGAGAAAGTGTGGTGAGCTCAGCGGTGCCAGCGGTGCTACCCGCACCACTTCC  
 TTCAAGGGCACGAGCCCAGTCACAAATACGTGAAGCTGAATGTGGGTGGAGGCCCTACTATACCA  
 TGGAGACGCTGACCAAGCAGGACACCATGCTGAAGGCCATGTCACGGGCCATGGAAGTGCTCACC  
 CAGTGAAGAACAAAGATACTTATGAGCCCTTCTGCAAGGCTCTGTGATCACCTCATCAAGGAAGAAC  
 AAAACTTATAGCGACTTCACAAATAGGACCGCGTGAAGTTGCTCTACAACAGAAGTACAACAAACTCA  
 TATACCAGCGATTCTGACGACAATATGTTATTGGGATGAAATCTGCTGCTGGTCTTTATGGTCAGGG  
 ACGGAAGGGTCTGTTCATAAAGGATGTTATTGGGATGAAATCTGCTGCTGGTCTTTATGGTCAGGG  
 CCGGAAGATTGCTGAAGTCTGTTGACCTCCATCGTCTATGCCACTGAGAAGAACAGACCAAGGTGGAG  
 TTTCCCGAAGCCGGATTATGAGGAGACCCCTGAAACATTGCTGTATGAGGCCAGGGTGGCCGGGGAC  
 CTGACAATGCGCTCTGGAGGCCACAGCGGGGGCGCTCCACACCTGGACGAGGAGCAGGAG  
 GCGGGAGCGGATCGAGCGCGTGGGGAGATCCACATCAAGCGCCCTGATGACCGGGCCACCTCCACC  
 TGACGAGGCAAGAGACCGAGCCGCCCTCTCACCGCCCCACTCCCTGCGTGCTACACCCAGATC  
 GTGCAGGCTGCCGGCCCTCTGCTTCCCTGGAGATACTTTGTAACAAGGCCAGATGATTA  
 TTTGGTATTGCTTGACAAGGCAAATTGATTGCTTGTGACCCAGGCCATGACCCCTGCTGTTGAACAAGC  
 TGCTGCTAAGATCTACTTTCATGAGAATCTGAGACTCTTGAGGCCAGGCTTCTGGTTCTCAGAG  
 GAAAATGATGAATGAGTGTGAAGTGTATGTGAGAACACTTTGTTGCAATATTATTTGGTGGTGT  
 CTTCTGTGGCTTGGCTTGGGCAACTCTGCTTGGGCTTAAGGGTCTAGTTGACAATTCTGAGAGTTGCT  
 AGTGGAGGCCACAGAGGATCTGAGCTCCCTGCTTGGGCAACTCTGAGGCTTGTGAGACGTC  
 ACTCCTGGTCTGTGTTGGGCCACATCAGCTCCCTGACAGGGCATAGCTATAAAGTACCCCTCC  
 GGATGGGCTAGAGCTGTTGATAATTGAGCTTGTGAGGCTTGTGAGGAAATATGGCTGAATGAGCGT  
 ATCGTTGAGACCACTGCAACTTGGGTGCAAGGCTTGTGAGGATCAAGCCTTGGCACCTGGGCT  
 GGTCTTGGCTGGTCACTGGGACCCATATGTCGCGTAGGAGCAGAACCTTCCATGGCAGTAAGT  
 GTCCAGCTGTTCTGGTCTTCCCTGCTGCTGATTTTACACAGTGTAGAGTGGCCAGCAGTGA  
 CACTCCAGGAAGGCCATCTGACCCCTGACAGGGCATAGCTATAAAGTACCCCTCC  
 CTCTGAGGCTTGGGCTAGAGCTGTTGATAATTGAGCTTGTGAGGCTTGTGAGGAAATATGGCTGA  
 ATCGTTGAGACCACTGCAACTTGGGTGCAAGGCTTGTGAGGATCAAGCCTTGGCACCTGGGCT  
 CCATACCCCTTGTCCCTCCAGGCCATCCAGGACACCCCTCACACCACAGCCCCAGGGAGCTT  
 CCCGCTATAAACACAGACCCCTTGTCTTGCCTCTGATTTTACACAGTGTAGAGTGGCCAGCAGTGA  
 ACAGGTTGAGGATGTGCGGGTAGATAAGATAACTTGGGTCTGGTTGTGCTGTTGATGTTGTTAA  
 GGGATATGTTGACTGTGGGTGGGGACGTGTGCTTGTGGGGCACAGGTGGGGCCCTGCTGGAGCCTGG  
 CTGGGGCGAGCGCCTATGAGGACGGGTGTTCTGACCTACCTCCAGGCTCCCTGACCTGCAA  
 GGAACAGGAGTGTGACTGACAGGGGTGGGAGACTAGACTAGGTAGAGTAGTTACCAGGAGATG

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TGAATGTGCGTCAGGTGATGGATGGTTGTCAAGGAAATCGTACCGTTTATACCAAAGGTATTAACA  
TGGCAGCCTTGACACATGTATTCCAAAAACGAGTTATTTCAAACGGTTTACAGCTTAGACTT  
TGTACTTACTGCCCTGCCTGTGACAGTTGATGCCCTCATTTGTATCCAACAGCAAAGTCTACAATAAA  
ACTTAAAACAATCATG

Human MSTP028 Protein sequence - var1 (public gi: 13994353) (SEQ ID NO: 255)  
MEEMSGESVVSSAVPAAATRTTSFKGTPSSKYVKNVGGALYTTMQTLTKQDTMLKAMPSGRMEVLTD  
SEGWLIDRCGKHFGTILNYLRDGAAPLPESRREIEELAEAKYLVQGLVEECQAALQNKTYPFCKV  
PVITSSKEEQKLIATSNKPAVKLLYNRSNNKSYTSNSDDNMLKNIELFDKLSLRFNGRVLFIKDVGDE  
ICCWFSFYQQRKIAEVCCSIVYATEKKQTKVEFPEARIYEETLNILLYEAQDGRGPDNALLEATGGAAG  
RSHHLDEDEERERIERVRIHIKRPPDDRAHLHQ

Human MSTP028 Protein sequence - var2 (public gi: 14042295) (SEQ ID NO: 256)  
MSGESVVSSAVPAAATRTTSFKGTPSSKYVKNVGGALYTTMQTLTKQDTMLKAMPSGRMEVLTDSEG  
WILIDRCGKHFGTILNYLRDGAAPLPESRREIEELAEAKYLVQGLVEECQAALQNKTYPFCKVPVI  
TSSKEEQKLIATSNKPAVKLLYNRSNNKSYTSNSDDNMLKNIELFDKLSLRFNGRVLFIKDVGDEICC  
WSFYQQRKIAEVCCSIVYATEKKQTKVEFPEARIYEETLNILLYEAQDGRGPDNALLEATGGAAGRSH  
HLDEDEERERIERVRIHIKRPPDDRAHLHQ

Unigene Name: PACS-1 Unigene ID: Hs.58589

Human PACS-1 mRNA sequence - var1 (public gi: 27781345) (SEQ ID NO: 95)  
AGCACGAGTCTGGTTGTGCCGGAGAAAGTCAAAACTCCCAGTAAAGTCCAGTAAACGGATCTCAGGGCT  
CTGCTCCCCCAGCAAAGTGGAGGGGGTGACACACCCGGAGAAGAGGAGCAGCCCTGAAGGAGCG  
GCAGCTCTCAAGCCCCCTAACAGTGGAGGACCAACAGTCCAGCGAGCGCTCCCCAGATCTGGCCAC  
AGCACCGAGATCTCAAGAAAGGTGGTGTATGACCAGCTCAATCAGATCTGGTGTAGATGCAGCCCTCC  
CAGAAAATGTCATTCTGGTGAACACCAACTGACTGGCAGGGCAGTATGGCTGAGCTGCTCCAGGACCA  
GCGGAAGGCTGTGGTGTGACCTGCTCCACCGTGGAGGTCCAGGCCGTGCTGCTCCGCCGTGCTCACCGG  
ATCCAGCGCTACTGCAACTCTTCCATGCCAGGCCAGTGAAGGTGGCTGCTGTGGAGGCCAGA  
GCTACCTGAGCTCCATCCTCAGGTTCTTGTCAAGTCCCTGCCAACAGACCTCCGACTGGCTGGCTA  
CATGCGCTTCCATCATCCCCCTCGTTCTCACCCCTGTGGCAAATACTGGGTCAAGTCAGACTAAA  
TACAGTAGTTCTTCTGGATTCTGGTGGAGGAATCTGTTCACTGCGTCCAGGCCACAGCTCCGAG  
AACTGGACGTGGCAGGGGGGTGATGCACTACGTCAGTCAACGGGGCAGGCCACACACCAGCTCCGTGG  
CGAAGCCATGCTGACTTGGCCGATAAGTCCCTGATGAAGACTCCTATCAGAAGTTATTCCCTCATT  
GGCGTGGTGAAGGTGGGTCTGGTGAAGACTCTCCCTCCACAGCAGGCCATGGGACGATTCTCTGTGG  
TCAGCCTTACTGTGCCCTCACATCACCAACCCCTCAGCTGGCCTGAGGCCAGGCCACGGCCACCCC  
TCCCTCCCTCCATCTATGAGCAGGCCCTGGCAGTGGGAGCCCTAATAGCCATATGGGACGTG  
ATTGGCCTCAGGTGGACTACTGGCTGGGCCACCCGGGGAGCGGGAGGGAGGGCACAAGAGGGAGC  
CCAGCTCGAAGAACACCCCTCAAGAGTGTCTCCGCTCAGTGCAGGTGTCCGCCATAGGGGA  
GGCCCAGCTTCTGGCACCAGGCCATGACTGTGGTACCAAGAAAAGAACAGAAAGTTCCACCATC  
TTCTGAGCAAGAACCCCGAGAAAAGGAGGTGGATTCTAAGAGCCAGGTCAATTGAAGGCATCAGGCC  
TCATCTGCTCAGCCAAGCAGCAGCAGACTATGCTGAGGTGTCCATCGATGGGTGAGTGGAGTGCAT  
CAAGTTCTCCAGCTGGCAGGCCAGTGGCCACCCATGTCAGCAGCACTTCCAGTGGACTCTTCAGTGG  
AGCAAGGCCACCTGAGGCCCTGTCTCCAGGCCACTTCCCTGGCAGTGGCAGGCCACGGCCACAGC  
CGGGCAGGGGAGGCCAGCAGGCCACGGCCAGGCCACTTCCCTGGCAGGCCACGGGTCTGCCCTCACTCG  
CCCAGGTCCCCAGGACACTGCCACAGGGACGCCCTCCCTCCCTGGCAGGCCACGGCCACAGC  
CCCTCCCTCCCTGGCTTCTCCCTCTGGCTCCAGGCCAAGGCGTGTGGTTTGCCCTCTG  
GTGCCCATAGTCCCCTGGAGTCCCCAGGCCCTCTCACCCAGTCCAAACTCTCCTGTGGT  
ATCAGTTCTCTCGGAAATGAGAAAGCTGGATCTGGTCCCCAGCAGGAGAGCCTAGTCCTCCCCA  
GCCCTCCAGGCCACCAGGGTGTCTAGGATGCACTGCCAGATCCACTCTGCTGCCCTCAGCAG  
GACCCAAGGCCACTTCAACTCTTATGGGTTCTCCACCTGCCAGAGCTCTCAAGGGAGGGTAAGGG  
GGCACCCCTGAGGCCACAGGCCACTTCAAGCTCACAGGGCAGGAGGCAGTCCCTGCCAG  
ACCCCTGTTGCTATGGTACACAGCGTTCTAGGACAGAGGGCTCCAGTCTCCCCCACCACCCGTGC  
ACGACTTCCCTACCACCCAGGGTCCCTGCAAGATGTCGTGTGCTCTGAGTTCTTGGTTCTTG  
CACGCCAGTCTCTGGTTGTACCATGTGACACACCCCTGCACTGGTGTGCTCTCGTGGCTCCACC  
CTTGTAAATGATGCTCTGCCCTCTGCCCTCCAGGCCACTTCAAGCTCACAGGGCAGGAGGCAGTCC  
ATGGGAGGCAGACCCCCACCAACATGCTGTCAGGCCCTCAGACATTCTGTTTCACTCCCATT  
CATCTCCCTCTCCACCGCTGTCAGTTCTGCTCTGCCCTCTGCTGTTCTTGGCTTCTTG  
ACCCCTGGGCCAGACCCATCTCCAGGCCAGGGTCTCCAGGCCACTTCCCTGCCAGTGCACCTCC  
CTCTCACCAACCCGGGGTCTGAGGCCCTCATTCTGACCGTCCGTGTTCTCAGGAGTGGTTGAGGACACA  
GGGCCAGGCCAGCCCTCTGCAACCCAGGCCACTTCAAGCTCACAGGGCAGGAGGCAGTCCCTGCCAG  
TCTTGCTCTCACTCTCCAGAAGTTTGACAGAACATTCTGTTCTCATTCTC

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CATAACCTCCCCAAGCTCTCCAGCCCTTCCCAGGGCTCAGCCCTGCTGTCTGAGCGTCTCCGGC  
CAGAGAGAGGAGATGGGGTGGGAGGACTGAGTTGATGTTGGGTTTTCAATTAAATTGGTGATT  
CTTAAAAAAAAAAAAAAA

Human PACS-1 mRNA sequence - var2 (public gi: 30962845) (SEQ ID NO: 96)  
CCTCGGCCCTCGTAACCCCCGCTAGCGGGCATGGCGAACGCGGAGGGCGGGTGGTCCGGAG  
GCAGCGGGGGCGGCAGCGGCCAGCGGGATCCGGGTCGCCAGTCCCGTCAGCAGCGCCGCCAGCA  
GCAGCAGCAGCAGCCGCCAGCGACGCCAACCTCGTCGTCCTCCACCTCCAGGCGTGGCGGTGGCCTCGG  
ACCTCGGCCGGCTGCCCTCCCTCGTCGTCCTCCACCTCCAGGCGTGGCGGTGGCCTCGG  
GCTCCGCGCTCCCGTGGCCGGCCAGGCCAGGCCACCCCGCCGGTCAAGATGAACCTGTACGCCAC  
CTGGGAGGTGGACCGGAGCTCGTCCAGCTGCGTGCCTAGGCATTTCAGCTGACCTGAAGAAACTCGTC  
ATGCTAAAGAAATGGACAAAGATCTAACTCACTAGTGGTCACTCGCTGTGAAGCTGAGGGTTCAAAAGAA  
TTCTCGCTCCAACAGAGATCGTCCTCCAGCTAGTGGACTGGAAACAGAGCTCAATTAAACCTCTC  
CCTCAGTACCCCTATTCTTAAGCGAGATGCCAACAGCTGCAGATCATGTCGAAAGGAGAAAACGT  
TACAAGAATCGGACATCTGGGCTATAAGACCTTGGCGTGGGACTCATCAACATGGCAGAGGTGATGC  
AGCATCTAATGAAGCGCACTGGTGTGGCCTACACAGCAACGTGAAGGATGTCCTGTGCCTGTGGC  
AGAAATAAAAGATCTACTCCCTGTCCAGCCAACCCATTGACCATGAAGGAATCAAATCAAGCTTCTGAT  
CGTCTCCGTATATTGACAATTATTCTGAGGAAGAGGAAGAGAGTTCTCATCAGAACAGGAAGGCAGTG  
ATGATCCATTGCACTGGCAGGACTTGTCTACGAAGACGAAGATCTCCGAAAGTGAGAAGAACCCGGAG  
GAAACTAACCTAACCTCTGCCATACAAGGAACTAACATCAAACAGAAAGTGTGGCCCTCCTGAAG  
CGGTTAAAGTTTCAGATGAGGTGGGTTGGCTGGAGCATGTGTCCCGCAGCAGATCCGGGAAGTGG  
AAGAGGACTTGGATGAATTGTATGACAGCTGGAGATGTAACCCAGCGACAGTGGCCCTGAGATGGA  
GGAGACAGAAAGCATCTCAGCACGCCAACAGCTCAAGCTAACCTTCTTGGGGATGTCAGTCC  
AGTCCCAGGAGATTGGCAGGAGATTGGCAGCCTAACAGCAAAGGAGCCTGGAAAAGACACCACAGCCCTATGG  
AATTGGCTGCTCTAGAAAAAAATTAAATCTACTTGGATTAAAACCAAGATGACAGCTGACTGAAACAGA  
CACTCTGGAAATCACTGACCAGGACATGTTGGAGATGCCAGCAGGACTCTGGTTGTGCCGGAGAAAGTC  
AAAACCTCCATGAAGTCCAGTAAACGGATCTCAGGGCTCTGCCCTCCCCAGCAAAGTGGAGGGGTGC  
ACACACCCCGCAGAACAGGAGCACGCCCTGAAGGAGCGCAGCTCTCAAGCCCTAACGTGAGAGGAC  
CAACAGTTCCGACAGCGAGCGCTCCCGAGATCTGGGCCACAGCACGAGATTCCAAGAAAGGTGGTGTAT  
GACCAGCTCAATCAGATCTGGTGTAGATGCAAGCCCTCCAGAAAATGTCATTCTGGTGAACACCAC  
ACTGGCAGGGCAGTATGTGGCTGAGCTGCTCAGGACCAGCGGAAGCTGTTGTGCACCTGCTCCAC  
CGTGGAGGTCCAGGCCGTGCTGCCGCTGCTACCCGGATCCAGCCTACTGCAACTCTTCC  
ATGCCGAGGCCAGTGAAGGTGGCTGCTGGGAGGCCAGAGCTACCTGAGCTCCATCCTCAGGTTCTTG  
TCAAGTCCCTGGCCAACAGACCTCCGACTGGCTGGCTACATGCGCTCCTCATCCTGGTTTC  
TCACCCCTGTGCCAAATACTGGGCTAGTCAGAATACAGTAGTTCTCTGGATTCTGGTTGG  
AGAGATCTGTCAGTCGCTCGGAGCACCAGTGTCAAGAGCAACTGGACGTGGCAGGGCGGGTGTGCAGT  
ACGTCAACGGGAGGCCACGACACACCAGCTCCGTGGCGAAGCCATGCTGACTTGGCGGATAAGTT  
CCCTGATGAAGACTCTATCAGAAGTTTATTCCCTCATGGCGTGGTAAGGTGGGTCTGGTTGAAGAC  
TCTCCCTCCACAGCAGGCCAGGAGGAGCTGGGACATTCTCTGTGGCAGCCTACTGTGCCCTCCACATCACCAC  
CCTCCAGCTCGGGCTGAGCCAGACGCCACGCCACCCCTCCCTCCCATCTATGAGCAGGCCCT  
GGCATCGTGGGAGGCCATAAGCCATATGGGACGTGATTGGCCTCAGCTGGACTACTGCTGG  
CACCCCGGGAGCGGAGGGAGGAAGGCGACAAGAGGGAGCCAGCTGAAGAACCCCTCAAGAGTGTCT  
TCCGCTAGTCAGGTGTCAGGAGCTCCGCTGCCAGGAGCTGGGAGGCCAGCTTCTGGCACCAGGCCATGAC  
TGTGGTCACCAAAGAAAACAAGAAAGTCCCACCATCTCCAGAAGCAAGAAACCCCGAGAAAAGGAG  
GTGGATTCTAAGAGCCAGGTATTGAAAGGCATCGGCCCTCATCTGTCAGCCAGCAGCAGCAGACTA  
TGCTGAGAGTGTCCATGGTGTGGAGTGACATCAAGTTCTCCAGCTGGCAGGCCAGTGGCC  
CACCCATGTCAAGCAGCTTCCAGTGGAGCTTCACTGAGCTGGCAGCAAGGCCACCTGAGGCCCTGCTCCAG  
CCACTTTCCCTCTGGCAGGCCACAGGCTGCTCTCACTGCCAGGCCAGGGGGAGGCCAGGCCAGGCC  
CAGCACCCCTCCCTGGCAGGCCACAGGCTGCTCTCACTGCCAGGCCAGGGGGAGGCCAGGCCAGGCC  
CGCCCTCCCTCCCTGCCAGGCCACCCCTGCAAGGCCCTCCCTCCAGGCCAGGGGGAGGCCAGGCC  
CTCCCTGCTCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCC  
AGGCCCTCCCTCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCC  
AGGCCCTCCCTCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCC  
ATGCAGCTGCCAGATCCACTCACTCTGCTGCCCTCAGCAGGCCAGGCCACTTCAACTCTTATGGGG  
TTCTCCACCTGCCCTCAGGAGCTTCTCAAGGGAGGGTAAGGGGCCACCCCTGAGGCCACAGGCCCTACTTC  
ACAGCTCACAGGGGAGGAGGAGCTCCCTGCCAGGCCAGGCCACTGTTGCTATGGTGAACAGCGTTCT  
AGGACAGAGGGGCCCTCCAGTCTCCCCCAGGCCACCCCTGCAAGCAGCTTCTCAGGCCACCC  
CAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCC  
CAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCC  
CACACCCCTGTCAGCTGGCGCTGCTGGCTCCACCCCTGTTAATGATGCTCTGCCCTGCC  
CAGGCCCTCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCC  
CTGTCTGTGGCCCTCAGACATTCTGTTCATCTCCCATCTCCCTCTCCACCGTGTAGTTT  
CTGCCCTTCCCTGCTGTTCTTCCCTCTAGGCCAGGCCAGGCCAGGCC  
GGTTCCCTCCAGCAGGCCCTCCCTGCCCTGTCACCTCCCTCTGCC  
GGTTCCCTCCAGCAGGCCCTCCCTGCCCTGTCACCTCCCTCTGCC

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TTCTGACCGTCGTTCAGGAGTGGTGAGGACACAGGGCCCCAGCCCAGCCCTCTGCACCCCCCA  
GCCGGCCATCTGCAGCCCCACAGCCCCCTGGAGCTTCTCTGCTCTCACTCCTCCAGAAGTTT  
TTGACAGAACCTCATTTGAAAGTGTCTCATTCTCACCTCCCCAAGCTCCTCCAGCCCT  
TCCCAGGGCTCAGCCCTGCTGCTGAGCGTCTCCTGGGCCAGAGAGAGGAGATGGGGTGGGAGGGACT  
GAGTTGATGTTGGGTTTTCAATAAAATTGGTGATTCTACCGACAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAA

Human PACS-1 mRNA sequence - var3 (public gi: 33243994) (SEQ ID NO: 97)  
CAGAAAGCATCTCAGCAGCCAAAGCCAAGCTCAAGCCTTCTTGAGGGATGTCGAGTCCAGCTC  
CCAGACGGAGATTGGCAGCTCAACAGCAAAGGCAGCTCGGAAAAGACACCAGCCCTATGGAATTG  
GCTGCTCTAGAAAAAATTAAATCTACTTGGATTAAAACCAAGATGACAGCTTGACTGAAACAGACACTC  
TGGAAATCACTGACCAGGACATGTTGGAGATGCCAGCACGAGTCTGGTGTGCCGGAGAAAGTCAAAAC  
TCCCAGTGAAGTCCAGTAAAACGGATCTCAGGGCTCTGCCCTCCCCAGCAAAGTGGAGGGTGCACACA  
CCCCGGCAGAAAGGAGGACAGCCCCCTGAAGGAGGGCAGCTCTCAAGCCTAAAGGAAAGGTGGTGTATGACCA  
GTTCCGACAGCAGCGCTCCCAGATCTGGCCAAGCAGCAGATTCAAGAAAGGTGGTGTATGACCA  
GCTCAATCAGATCCTGGTGTAGATGCAAGCCTCCAGAAAATGTCATTCTGGTAACACCAACTGACTGG  
CAGGGCCAGTATGTGGCTGAGCTGCTCAGGACAGCGGAAGCCTGTGGTGTGCCACTGCTCCACCGTGG  
AGTCCAGGCGTGTGTCGCCCCGTCACTGCACTGCAACTGCAACTCTTCATGCC  
GAGGCCAGTGAAGGTGGCTGCTGAGGAGGAGCTACCTGAGCTCCATCCTCAGGGTTCTGTCAAG  
TCCCAGGCAACAAGACCTCGACTGGCTTGCTACATGCGCTTCCCTCATCATCCCCCTGGTTCTCACC  
CTGTGGCAAATACTTGGGTCAGTCAGTAATACAGTAGTTCTTCTGGATTCTGGTTGAGAGA  
TCTGTTCACTGCTCGGAGCCACCAGTGTCAAGAGCAACTGGCAGTGGCAGGGGGGATGCACTGTC  
AACGGGGCAGCACGACACACCAGTCCCGTGGCGAAGCCATGCTGACTTGGCCGATAAGTCCCTG  
ATGAAGACTCTATCAGAAGTTTATCCCTCATGGCGTGTGAAGGTGGTCTGGTTGAAGACTCTCC  
CTCACAGCAGCGATGGGACGATTCTCGTGTGCTAGCCTACTTCCCTCCATCTGAGCAGCGCCCTGGCCA  
AGCTGGGCTTGAGCCGAGACGCCAACGGCCACCCCTCCCTCCATCTGAGCAGCGCCCTGGCCA  
TCGTGGGAGCCCTAATAGCCATATGGGACGTGATTGGCTCAGGTTGGACTACTGGCTGGGCCACCC  
CGGGGAGCGAGGGAGGGAGGCGACAAGAGGGACGCCAGCTGAAGAACACCCCTCAAGAGTGTCTCCGC  
TCAGTGCAGGGTGTCCCGCTGCCCATAGTGGGAGGCCAGCTTCTGGCACCATGGCAGTGTGG  
TCACCAAAGAAAAGAACAGAAAGTCCCACCATCTCCTGAGCAAGAAACCCCGAGAAAAGGAGGTGGA  
TTCTAAGAGCCAGGTCACTGAAGGCATCAGCCGCTCATCTGCTCAGCCAAGCAGCAGACTATGCTG  
AGAGTGTCCATCGATGGGTCGAGTGGAGTGCATCAAGTTCTCCAGCTGGCAGCCAGTGGCCACCC  
ATGTCAAGCACTTCCAGTGGACTCTCAGTGCAGCAAGGCCACCTGAGGCCCTGTCTCCAGCCACT  
TCCCTCCTGGCACTGCCACAGCCTCACGCCCTGCGGAGGGGAGGCCAGCAGGCCGGGCCAGCA  
CCCCCTCCCTGGCACCCAGGGTCTGCCCTCTCACGCCCTCCAGGCCAGGGTCCCAAGGACACTGCCACAGGCC  
TCCCTCCCTCCCTCCAGGCCACCCCTGCCACAGGCCCTCCCTCCAGGCCAGGGTCCCTCCAGGCC  
GCTCCAGGCCAACAGCGTGTGGTTCTGGCTTCTGGCCCATAGTCCCTGGACTGAGTCCCCCAGGCC  
TTCCTCACCCGACTTCCAAACTCTTCCCTGTGGTATCAGTTCTTGGAAATGAGAAAGCTGGAAAT  
CCTGGTCCCCAGCAGGAGAGCCTAGTCTCTCCCCAGGCCCTCCAGGCCACCCAGGGTGTCCCTAGGATGCA  
GCTGCCAGATCCACTCTGCTGCCCTCAGCAGGCCAGGCCACTTCAACTCTATGGGTTCT  
CACCTGCCCAAGAGCTCCAAGGGAGGGTAAGGGGACCCCTGAGCCACAGGCCCTACTTACAGC  
TCACAGGGGCAAGGAGGAGCTCCCTGCCCTCAGGCCCTGTTGCTATGGTACACAGCGTTCTAGGAC  
AGAGGGGCCCTCCAGTCTCCCCCACCACCCGTGCAGACTCCTCACCCAGGGTCCCTGAGAT  
GTCGTGTGTCTGAGTGTGTTCTTGGTCTTGCACGCCAGTCTCTGGTTGACATGTGACACAC  
CTGTGCACTGGCGCTGCTCTCGTGTGCTTCCACCCCTGTTAATGATGCTCTGCCCTGCGCTCCAGGCC  
CCTCACCCAGCACAGCTCGCTGGACTTGGAGAGATGGGAGGCCAGACCCCCCAGGCCACCCATATGCTGTC  
TGTGGCCCTCAGACATTCTGTTCTCCCATCTCCCTCCAGGCCCTGCCAGGCCAGGGTT  
TTCCTCTGCTCTGTTCTCCCCCTCTCTAGGCCCTGCTGCTCTCCAGGCCCTGCCAGGCCAGGGTT  
CCCTCCAGCAGGCCCTCTCTCTCTGTCACCTCCCTCTCACCAACCCGGGTCTGAGCCCCCTCATCTC  
GACCGTCCGTGTTCTCAGGAGTGGTTGAGGACACAGGGCCAGGCCAGGCCCTCTGCCACCCCCCAGGCC  
GCCATCTGCGCCCCACAGCCCCCTGGAGCTTCTCTGCTCTCACCTCTCCAGAAGTTTTGCA  
CAGAACTTCATTTGAAAGTGTGTTCTCATTCTCTATACCTCCCCAAGCTCTCCAGGCCCTCC  
GGGCTCAGCCCTGCTGCTGAGCGTCTGCCAGAGAGAGGAGATGGGGTGGGAGGGACTGAGTT  
GATGTTGGGTTTTCAATAAAATTGGTGATTCTTACCGACAAAAAAAAAAAAAAA

Human PACS-1 mRNA sequence - var4 (public gi: 34420884) (SEQ ID NO: 98)  
CGCGCCGCCGCCGCCGGGGAGGCTGGGAGGCCAGATCGCGTCGCCCTGGCTTAACCCCGCTA  
GCCGGGCCATGGCGAACCGGGAGGG  
GGGATCCGGGGTGCCTCAGTCCCTCAGCAGCCAGTGGCGAACGCCGGAGGGGGGGGGGGGGGGGG  
GGCGCCGG  
AGCAGCAGCAGGCCCGCAGGCCAGGCCAGGCCACGCCCTCTGCCACCTCTGCTCTCGTC  
CACCTCGGCCGGCTGCCCTCTCTGCTACCTCCACCTCCATGGCGTGGCGGTGGCGCTCG

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GGCTCCGCCCTCCGGTGGCCGGGGCAGGCCGCACCCCCCGGGTGCAGATGAACCTGTACGCCA  
 CCTGGGAGGTGGACCGGAGCTCGTCAGCTGCGCTAGGCTATTCACTCAGGGTACCGCTGAAAGAAACTCGT  
 CATGCTAAAGAAATGGACAAAGATCTTAACCTAAGCTGCTCTCCAGCTAGTGGACTGGTGGAAACAGAGCTCCAATTAAACCTCT  
 ATTCTCGCTCCAACGAGATCGTCTTCCAGCTAGTGGACTGGTGGAAACAGAGCTCCAATTAAACCTCT  
 CCCTCAGTACCTCATTTCTTAAGCGAGATGCCAACAGCTGCGATCATGCTGCAAAGGAGAAAACG  
 TTACAAGAATCGACCATCTGGCTATAAGACCTTGGCGTGGGACTCATCAACATGGCAGAGGTGATG  
 CAGCATCTAATGAGGCGCACTGGTGGCTACAGCAACAGTGAAAGGATGTCCTGTGCGCTGTGG  
 CAGAAATAAAGATCTACTCCCTGTCAGGCCAACCCATTGACCATGAAGGAATCAAATCCAAGCTTCTGA  
 TCGTCTCTGATATTCTGAGGAAGAGGAAGAGAGTTCTCATCAGAACAGGAAGGCAGT  
 GATGATCCATTGATGGCAGGACTTGTCTACGAGACGAAGATCTCCGGAAAGTGAAGAAGACCCGG  
 GGAAACTAACCTCAACCTCTGCCATACAAGGCAACCTAACATCAAACAGAAAGTGTGGCCCTCTGAA  
 GCGGTTAAAGTTTCAAGATGAGGTGGGTTGGGCTGGAGCATGTCAGGAGATGTCAGGAGATCCGGGAAGTG  
 GAAGAGGACTTGGATGAATTGTATGACAGTCTGGAGATGTCACACCCAGCGACAGTGGCCCTGAGATGG  
 AGGAGACAGAAAGCATCCTCAGCACGCCAACGCCAACGCTCAAGCCTTCTTGAGGGATGTCGAGTC  
 CAGCTCCCAGACGGAGATTGGCAGCCTAACAGCAAAGCAGCTCGGAAAGACACCACGCCCTATG  
 GAATTGGCTGCTTAGAAAAAATTAAATCTACTTGGATTAAAACCAAGATGACAGCTTGTACTGAAACAG  
 ACACCTGGAAATCACTGACCGAGACATGTTGGAGATGCCAGCACGAGCTGGTTGTGCGGGAGAAAGT  
 CAAAACCTCCATGAAGTCCAGTAAAACGGATCTCAGGGCTCTGCCAGGCTCCAGAACAGCTTCAAGTGGAGAGGA  
 CACACACCCCGCAGAAGAGGAGCACGCCCTGAAGGAGGGCAGCTCTCAAGGCCCTAAGTGGAGAGGA  
 CCAACAGTTCCCAGCGAGCGCTCCCGAGATCTGGGCCACAGCACGAGATTCCAAGAAAGGTGGTGT  
 TGACAGCTCAATCAGATCTGGTGTAGATGTCAGGCCCTCCAGAAAATGTCATTCTGGTGAACACCACT  
 GACTGGCAGGGCCAGTATGTTGGCTGAGCTGCTCCAGGACCAGCGGAAGCCTGTGGTGTGACCTGCTCCA  
 CGTGGAGGTCCAGGCCGTGCTGTCGCCCTGCTCACCCGGATCCAGCGTACTGCAACTGCAACTCTTC  
 CATGCCAGGCCAGTGAAGTGGCTGCTGGGAGGCCAGAGCTACCTGAGCTCATCTCAGGTTCTT  
 GTCAAGTCCCAGGCCAACAGACCTCCAGTGGCTTGGCTACATGCGCTCCTCATCATCCCCCTCGGTT  
 CTCACCCCTGTGCCAAATATTGGGGTCAGTCAGTAAATACAGTAGTTCTTCTGGATTCTGGTTG  
 GAGAGATCTGTCAGTCAGCTCGGAGCCACCAGTGTCAAGAGCAACTGGACGGCAGGGGGTGTGAG  
 TACGTCAACGGGCAGCCACGACACACCAGCTCCGTGGCCAGGCCATGCTGACTTGGCCGATAAGT  
 TCCCTGATGAAGACTCCTATCAGAAGTTTATTCCCTCATGGCGTGGTGAAGGTTGGCTGGTTGAAGA  
 CTCTCCCTCCACAGCAGGCGATGGGGACGAGTCTCTGTGGTCAAGCCTTACTGTGCCCTCCACATCACC  
 CCCCTCAGCTGGGCCAGGCCAGACGCCACGGGCCACGGCCATCTCCCTCCCTCATCTGAACAGGCC  
 TGGCCATCTGGGGAGGCCATAGCCCCATATGGGACGTATTGGCTCCAGGTGGACTACTGCTGG  
 CCACCCGGGGAGGCCAGGGAGGGAGGCCAGGCCACGGGACAGCTGAAGAACACCCCTCAAGAGTGT  
 TTCCGCTAGTCAGGTGTCAGGCTCCGCCAGCCATAGTGGGGAGGCCAGCTTCTGGCACCATGGCATGA  
 CTGTGGTCACCAAAGAAACTGAACAAGAAAGTCCACCATCTCCTGAGCAAGAACACCCGGAGAAAAGGA  
 GGTGGATTCTAAGAGCCAGGTCAATTGAGGCATAGCCGCTCATCTGTCAGCCAAGCAGCAGCAGACT  
 ATGCTGAGAGTGTCCATCGATGGGTCGAGTGGAGTGCACATCAAGTCTCCAGCTGGCAGGCCAGTGGC  
 CCACCCATGTCAAGCACTTCCAGTGGACTCTTCAGTGGCAGCAAGGCCACCTAG

Human PACS-1 mRNA sequence - var5 (public gi: 6330230) (SEQ ID NO: 99)  
 CTGCCATCAAAGCAACCTAACATCAAACAGAAAGTTGTGGCCCTCTGAAGCGTTAAAGTTCA  
 TGAGGTGGGTTGGCTGGAGCATGTCAGTGGCCGAGCAGATCCGGGAAGTGGAGAGGACTTGGATGAA  
 TTGTATGACAGTCTGGAGATGTCACACCCAGCGACAGTGGCCCTGAGATGGAGGAGACAGAAAGCATCC  
 TCAGCACGCCAACGCCAACGCTCAAGCCTTCTTGTAGGGGATGTCGAGTCAGCTCCAGCAGGCC  
 TGGCAGGCCCTAACAGCAAAGCAGCTCGGAAAGACACCCAGGCCATGGAAATTGGCTGCTCTAGAA  
 AAAATTAAATCTACTTGGATTAAAACCAAGATGACAGCTTGTACTGAAACAGACACTCTGGAAATCACTG  
 ACCAGGACATGTTGGAGATGCCAGCAGAGCTGGTGTGCCGGAGAAAGTCAAAACCTCCATGAAGTC  
 CAGTAAAACGGATCTCCAGGGCTCTGCCCTCCAGCAAGTGGAGGGGGTGCACACACCCGGCAGAAG  
 AGGAGCACGCCCTGAAGGAGCGGAGCTCTCAAGCCCTAAGTGGAGGAGCAACAGTCCGACAGCG  
 AGCGCTCCCCAGATCTGGCCACAGCACGAGATTCAAGAAAGGTGGTGTATGACAGCTCAATCAGAT  
 CCTGGTGTCAAGATGCAAGCCCTCCAGAAAATGTCATTCTGGTGAACACCACTGACTGGCAGGGCCAGTAT  
 GTGGCTGAGCTGCTCCAGGACCAGCGGAAGCCTGTGGTGTGACCTGCTCCACGGTGGAGGTCCAGGCC  
 TGCTGTCCGCCCTGCTCACCCGGATCCAGCGTACTGCAACTGCAACTCTCCATGCCAGGCCAGTGA  
 GGTGGCTGCTGGGAGGCCAGAGCTACCTGAGCTCATCTCAGGTTCTTGTCAAGTCCCTGCCAAC  
 AAGACCTCGACTGGCTGGCTACATGCGCTTCTCATCATCCCCCTCGTTCTACCCCTGTGGCCAAAT  
 ACTTGGGGTCAGTCGACAGTAAATACAGTAGTGTCTCTGGATTCTGGTTGGAGAGATCTGTTAGTC  
 CTCGGAGCCACCGAGTCAGAGCAACTGGACGCTGGCAGGGGGTGTGCACTGCAACCGGGCAGCC  
 ACGACACACCCAGCTTCCCGTGGCCAGGCCATGTCAGTGGCCGATTAAGTCCCTGATGAAGACTCCT  
 ATCAGAAGTTATTCCCTCATGGCTGGTCAAGCTGCTGACTTGGCCGATTAAGTCCCTGATGAAGACTCCT  
 CGATGGGGACGATTCTCTGTGGTCAAGCTTACTGTGCCCTCCACATCACCCACCTCCAGCTGGGCC  
 AGCCGAGACGCCACGCCACGGCCACCCCTCCCTCCCTCATCTAGAGCAGGCCCTGGCAGTGGGGAGCC  
 CTAATAGCCCATAATGGGACGTATTGGCTCCAGGTGGACTACTGGCTGGCCACCCGGGGAGCGGAG  
 GAGGAGAGGCCAGAAGAGGGACGCCAGCTGAAGAACACCCCTCAAGAGTGTCTCCGCTAGTGCAGGTG

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TCCCGCCTGCCCATAGGGGAGGCCAGCTTCTGGCACCATGGCATGACTGGTCACCAAGAAA  
AGAACAAAGAAAGTCCCACCATCTCTGAGCAAGAAACCCGAGAAAGGAGGTGGATTCTAAGAGCCA  
GGTCATTGAAGGCATCAGCGCCTCATCTGCTCAGCCAAGCAGCAGCAGACTATGCTGAGAGTGTCATC  
GATGGGGTGCAGTGGAGTGCACATCAAGTTCTTCAGCTGGCAGGCCACTGAGGCCAGTGGCCACCCATGTCAAGCACT  
TTCCAGTGGGACTCTCAGTGGCAGCAAGGCCACCTGAGGCCAGCAGGCCAGGCCAGCAGGCCACTTCCCTCTGGC  
ACTGCCACCCTCACCGGCTGGGGCAGGGCAGGCCAGCAGGCCAGGCCAGGCCAGGCCACTTCCCTCTGGC  
CACCAGGGCTGCCTCTCACTCGCCAGGTGGCAAGGACACTGCCACAGGGACGCCCTCCCTCCCTCC  
CCTCCAGGCCCCACCCCTGCACAGGCCCTCCCTGGCAAGGAGGTGGACTGAGTCCCCAGGCCCTCCCTCAGGCC  
AGGCGTGTGGTTTGCCTCTGGTGCCTAGTCCCCCTGGACTGAGTCCCCAGGCCCTCCCTCAGGCC  
ACTCCAAACTCTCCTTGTGGTATCAGTTCTCTCGGAAATGAGAAAGCTGGAATCTGGTCCCCAG  
CAGGAGAGCCTAGTCCTCCCCAGCCCTCCAGGCCACCAGGGTGTCTAGGATGCAAGCTGCCAGATCC  
ACTCACTCTGCTGCCTCAGCAGGACCAAGGCCACTTCAACTCTTATGGGTTCTCCACCTGCCAG  
AGCTTCCAAGGGAGGGTAAGGGGGCACCTGAGGCCACAGGCCACTTACAGCTCACAGCTCACAGGGCAG  
GAGGCAGCTCCCCTGCCTCCAGGACCCCTGGTGTATGGTACACAGCAGGTTCTAGGACAGAGGGGCC  
CAGTCTCCCCCACCACCGTGCACCACTCTCACCAACCCAGGTTCTGGCAGATGCTGTGT  
CTGAGTGTCTTGTGGTCTTGACCGCAAGTCTTGGTGTACCATGACACACCCCTGTGACTGG  
TCGCTGTCTCGTGGCTTCCACCCCTGTAAATGATGCTCTGCCTCTGCCCTCAGGCCCTCACCCAGCA  
CAGCTCTGCCGGACTGGAGATGGAGGAGATGGGAGGCCAGGCCACCCATACATGCTGTGTGGCC  
GACATTCTGTTCTCCATTCTCCTCCACCCCTCTGGCAGGCCAGGCCACCCATCTCCAGGTTCTCCCTCAGCAGG  
GTTCTCCCCCTCTTAGGGCCAGGCCAGGCCACCCATCTCCAGGTTCTCCCTCAGCAGG  
CTCCCTCCCTCCCTGTACCTCCCTCTACCAACCCGGGGTCTGAGGCCCTCATTCTGACCGTCC  
TCTCAGGAGTGGTGTAGGACACAGGCCAGGCCAGGCCACCCAGGCCATCTGCC  
CCACAGCCCCTTGGAGCTTCTCTGCTCTCACTCCTCCAGAAGTTTGACAGAACTTCATT  
TTGAAAGTGTCTTCTCATTCTCCATACCTCCCCAAGCTCCTCCAGGCCCTCCAGGGCTCAGCC  
GCTGCTGTGGAGCTCTGGCAGAGAGAGGAGATGGGGTGGAGGGACTGAGTTGATGTTGGTT  
TTCATTCAATAATTGGTGATTCTACCG

Human PACS-1 mRNA sequence - var6 (public gi: 7022110) (SEQ ID NO: 100)  
CCCTAAGTGGAGGACCAACAGTTCGACAGCGAGCGCTCCCCAGATCTGGGCCACAGCACGAGATTCC  
AAGAAAGGTGGTGTATGACCAGCTCAATCAGATCTGGTGTCAAGATGCAAGCCCTCCAGAAAATGTCATT  
CTGGTGAACACCAACTGACTGGCAGGGCCAGTATGTGGCTGAGCTGCTCAGGCCAGCGGAAGCC  
TGTGCACCTGCTCCACCGTGGAGGTTCCAGGCCAGTGTCCGGCTGCTGCTCAGGCCAGCGCTACTG  
CAACTGCAACTCTTCCATGCCAGGCCAGTGAAGGTGGCTGAGGCCAGAGCTACCTGAGCTCC  
ATCCCTCAGGTCTTGTCAAGTCCCTGGCCAATGACCTCCGACTGGCTGGTACATGCGCTTCTCA  
TCATCCCCCTCGGTTCTCACCCCTGGCCAATACTGGGGTCACTGACAGTAATAACAGTAGTTCT  
CTCTGGATTCTGGTGGAGAGATCTGTTCACTGCTCGGAGGCCAGTGTGAGAGCAACTGGACGTGGCA  
GGCGGGGTGATGCACTGCAACAGGCCAGGCCAGCACACCCAGCTTCCCGTGGCGAAGCCATGCTGA  
CTTGCCGGATAAGTCCCTGATGAAGACTCCTATCAGAAAGTTATTCCCTCATGGCGTGGTGAAGGT  
GGGTCTGGTGAAGACTCTCCCTCACAGCAGGCCAGGGACGATTCTCTGTGGTCACTGCTTACTGTG  
CCCTCCACATCACCACCCCTCAGCTGGGCTGAGGCCAGGCCACCCCTCCCTCCCCAT  
CTATGAGCAGGCCCTGCCATCGTGGGAGCCATAATGCCCATATGGGACGTGATTGGCTCCAGGT  
GGACTACTGGCTGGGCCACCCGGGGAGCGAGGGAGGGAGGCCAGCAAGAGGCCAGCTCGAAGAAC  
ACCCCTCAAGAGGTGTCTCCGCTCAGTGCAGGTGCTCCGCCGCTGCCCCATAGTGGGGAGGCCAGCTTCTG  
GCACCATGGCCATGACTGTGGTCACTAAAGGCCAGGTCAAGAGGCCAGGTCACTGAGGCCACGGCC  
ACCCCGAGAAAAGGAGGTGGATTCTAAGAGGCCAGGTCACTGAGGCCAGGTCACTGAGGCCACGGCC  
CCCTCCCTAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCC  
CTCCCTGTCACTCCCTCTACCAACCCGGGGTCTGAGGCCCTCATTCTGACCGTCCGTGTTCTCAGGA  
GTGGTTGAGGACACAGGCCAGGCCAGGCCAGGCCAGGCCAGGCCAGGCC  
CCTTGGAGCTTCTCTGCTCTCACTCCTCCAGAAGTTTGACAGAACTCATTGAAAGT  
GTTTTCTCATTCTCCATACCTCCCCAAGCTCCTCCAGGCCCTCCAGGGCTCAGCCCTGCTGT  
GAGCGTCTCTGGCAGAGAGAGGAGATGGGGTGGAGGGACTGAGTTGATGTTGGTTTCAATTCA  
ATAAAATTGGTGATTCTACCGAC

Human PACS-1 protein sequence - var1 (public gi: 7022111) (SEQ ID NO: 362)  
MPRPVKVAAVGGQSYLSSILRFFFVKSLANMTSDWLGYMRFLIPLGSHPVAKYLGSVDSKYSSFLDSGW  
RDLFSRSEPPVSEQLDVAGRVMQYVNGAATHQLPVAEAMLTCRHKFPPDEDSYQKFIPFIGVVKVGLVED  
SPSTAGDGDDSPVVSLSVPSTSPPSSGSLSRDATAATPPSSPMSSALAIVGSPNSPYGDVIGLQVDYWL  
HPGERRREGDKRDASSKNTLKSFRSVQVSRLPHSGEAQLSLGTMAVTKEKNKVKPTIFLSKKPREKE  
VDSKSQVIEGISRLICSSPSLGPSPDPSSQPGFPAGSFPPCHLPLTNPGSEPLIPDRPCSQEWLRTQ  
GPSPALCTPQPGHLRPTAPLEFSCPLTPSQFKLHRTSF

Human PACS-1 protein sequence - var2 (public gi: 6330231) (SEQ ID NO: 363)

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AITRQPNIKQKFVALLKRPKVSDEVGFGLEHVSREQIREVEEDLDELYDSLEMYNPSDGPMEETESIL  
STPKPKLKPFEGMSQSSQTEIGSLNSKGSLGKDTSPLMELAALEKIKSTWIKNQDDSLTETDTLEITD  
QDMFGDASTSLVVPEVKTPMKSSKTDLQGSASPSKVEGVHTPRQRSTPLKERQLSKPLSERTNSSDSE  
RSPDLGHSTQIPRKVVDQNLQILVSDAALPENVILVNNTDWQGQYVAELLQDQRKPVVCSTVEQAV  
LSALLTRIQRYCNCNSSMPPRVKVAAVGGQSYLSSFLDGSWRDLFSRSEPPVSEQLDVAGRVMQYVNGAATTHQLPVAEAMLT  
CRHKFPDEDSYLGVDVIGLQVDYWLGHPGERRREGDKRDASSKNTLKVSRVQSVRLPHSGEAQLSGTMAMTVVTKEK  
NKKVPTIFLSKKPREKEVDSKSQVIEGISRLICSAKQQQTMLRVSIDGVEWSDIKFFQLAAQWPTHVKHF  
PVGLFSGSKAT

Human PACS-1 protein sequence - var3 (public gi: 34420885) (SEQ ID NO: 364)  
MAERGGAGGGPGGAGGGSGQRGSGVAQSPQQPPPQQQQQQPQQPTPPKLAQATSSSSSTSAAAASSSSS  
STSTSMAVAVASGSAPPGGPGPGRTPAPVQMNLVYATWEVDRSSSCVPRLFSLTLKLVMLKEMDKDLNS  
VVIASKLQGSKRILRSNEIVLPASGLVETEQLTFSLQYPHFLKRDANKLQIMLQRKRYKNRTILGYKT  
LAVGLINMAEVMQHPNEGALVGLHSNVKDVSVPAVEIKIYLSQQPIDHEGIKSLSDRSPDIDNYSEE  
EEESFSSEQEGSDDPLHGQDLYEDEDLRKVKKTRRKLTSATRQPNIKQKFVALLKRFKVSDEVGF  
LEHVSREQIREVEEDLDELYDSLEMYNPSDGPMEETESILSTPKPKLKPFEGMSQSSQTEIGSLNS  
KGSLGKDTSPLMELAALEKIKSTWIKNQDDSLTETDTLEITDQDMFGDASTSLVVPKEVKTPMKSSKTDL  
QGSASPSKVEGVHTPRQRSTPLKERQLSKPLSERTNSSDSERSPDLGHSTQIPRKVVDQNLQILVSDA  
ALPENVILVNNTDWQGQYVAELLQDQRKPVVCSTVEQAVLSALLTRIQRYCNCNSSMPPRVKVAAVG  
GQSYLSSILRFFVKSLANKTSDWLGYMRFLIIPLGSHPVAKYLGSDSKYSSSFLDGSWRDLFSRSEPPV  
SEQLDVAGRVMQYVNGAATTHQLPVAEAMLT  
CRHKFPDEDSYQKFIPIFIGVVKVGLVEDSPSTAGDDDS  
PVVSLTVPSPPSSGLSRDATA  
TPSSPSMNSALAIVGSPNSPYGDVIGLQVDYWLGHPGERRREGDK  
RDASSKNTLKVSRVQSVRLPHSGEAQLSGTMAMTVVTKEK  
NKKVPTIFLSKKPREKEVDSKSQVIEGI  
SRLICSAKQQQTMLRVSIDGVEWSDIKFFQLAAQWPTHVKHF  
PVGLFSGSKAT

Human PACS-1 protein sequence - var4 (public gi: 33243995) (SEQ ID NO: 365)  
ESILSTPKPKLKPFEGMSQSSQTEIGSLNSKGSLGKDTSPLMELAALEKIKSTWIKNQDDSLTETDTL  
EITDQDMFGDASTSLVVPKEVKTPMKSSKTDLQGSASPSKVEGVHTPRQRSTPLKERQLSKPLSERTNS  
SDSERSPDLGHSTQIPRKVVDQNLQILVSDAALPENVILVNNTDWQGQYVAELLQDQRKPVVCSTVE  
VQAVLSALLTRIQRYCNCNSSMPPRVKVAAVGGQSYLSSILRFFVKSLANKTSDWLGYMRFLIIPLGSH  
PVAKYLGSDSKYSSSFLDGSWRDLFSRSEPPVSEQLDVAGRVMQYVNGAATTHQLPVAEAMLT  
CRHKFPD  
EDSYQKFIPIFIGVVKVGLVEDSPSTAGDDDS  
PVVSLTVPSPPSSGLSRDATA  
TPSSPSMNSALAIVGSPNSPYGDVIGLQVDYWLGHPGERRREGDK  
RDASSKNTLKVSRVQSVRLPHSGEAQLSGTMAMTVVTKEK  
NKKVPTIFLSKKPREKEVDSKSQVIEGI  
SRLICSAKQQQTMLRVSIDGVEWSDIKFFQLAAQWPTHVKHF  
PVGLFSGSKAT

Human PACS-1 protein sequence - var5 (public gi: 30962846) (SEQ ID NO: 366)  
MAERGGAGGGPGGAGGGSGQRGSGVAQSPQQPPPQQQQQQPQQPTPPKLAQATSSSSSTSAAAASSSSS  
STSTSMAVAVASGSAPPGGPGPGRTPAPVQMNLVYATWEVDRSSSCVPRLFSLTLKLVMLKEMDKDLNS  
VVIASKLQGSKRILRSNEIVLPASGLVETEQLTFSLQYPHFLKRDANKLQIMLQRKRYKNRTILGYKT  
LAVGLINMAEVMQHPNEGALVGLHSNVKDVSVPAVEIKIYLSQQPIDHEGIKSLSDRSPDIDNYSEE  
EEESFSSEQEGSDDPLHGQDLYEDEDLRKVKKTRRKLTSATRQPNIKQKFVALLKRFKVSDEVGF  
LEHVSREQIREVEEDLDELYDSLEMYNPSDGPMEETESILSTPKPKLKPFEGMSQSSQTEIGSLNS  
KGSLGKDTSPLMELAALEKIKSTWIKNQDDSLTETDTLEITDQDMFGDASTSLVVPKEVKTPMKSSKTDL  
QGSASPSKVEGVHTPRQRSTPLKERQLSKPLSERTNSSDSERSPDLGHSTQIPRKVVDQNLQILVSDA  
ALPENVILVNNTDWQGQYVAELLQDQRKPVVCSTVEQAVLSALLTRIQRYCNCNSSMPPRVKVAAVG  
GQSYLSSILRFFVKSLANKTSDWLGYMRFLIIPLGSHPVAKYLGSDSKYSSSFLDGSWRDLFSRSEPPV  
SEQLDVAGRVMQYVNGAATTHQLPVAEAMLT  
CRHKFPDEDSYQKFIPIFIGVVKVGLVEDSPSTAGDDDS  
PVVSLTVPSPPSSGLSRDATA  
TPSSPSMNSALAIVGSPNSPYGDVIGLQVDYWLGHPGERRREGDK  
RDASSKNTLKVSRVQSVRLPHSGEAQLSGTMAMTVVTKEK  
NKKVPTIFLSKKPREKEVDSKSQVIEGI  
SRLICSAKQQQTMLRVSIDGVEWSDIKFFQLAAQWPTHVKHF  
PVGLFSGSKAT

Unigene Name: PPP1CA Unigene ID: Hs.183994

Human PPP1CA mRNA sequence - var1 (public gi: 287796) (SEQ ID NO: 101)  
GCAAGGAGCTGCTGGCTGGACGGCGGCATGTCCGACAGCGAGAACGCTAACCTGGACTCGATCATCGGGC  
GCCCTGCTGGAGTGCAAGGGCTCGCGGCCATGGCAAGAACATGTACAGCTGACAGAGAACGAGATCCCGGGTCT  
GTGCGCTGAAATCCCGGGAGATTTCCTGAGCCAGCCCATTCTCTGGAGCTGGAGGGCACCCCTCAAGATC  
TGCAGGTGACATAACACGGCCAGTACTACGACCTCTCGCAGTATTGAGTATGGCGGTTCCCTCCCGAGA

PCT/US04/06308

GCAACTACCTCTTCTGGGGACTATGTGGACAGGGCAAGCAGTCCTGGAGACCATCTGCCTGCTGCT  
GGCCTATAAGATCAAGTACCCGAGAACCTCTTCTGCTCCGTTGGAAACACGAGTGTGCCAGCATCAAC  
CGCATCTATGGTTCTACGATGAGTGAAGAGACGCTACAACATCAAACACTGTGGAAAACCTTCAGTGACT  
GCTTCAACTGCCATGCCATCGCGGCCATAGTGGACGAAAAGATCTTCTGCTGCCACGGAGGCTGTCCCC  
GGACCTGCACTGCTATGGAGCAGATTGGCGGATCATGCCGCCCACAGATGTGCTGACCAGGGCTGCTG  
TGTGACCTGCTGTGGCTGACCCCTGACAAGGACGCTGCAGGGCTGGGGAGAACGACCGTGGCGTCTCTT  
TTACCTTGAGGGCCAGGGTGGCCAAGTCTCCACAAGCACGACTTGGACCTCATCTGCCAGACACA  
CCAGGTGGTAGAAGAGACGGCTACGAGTTCTTGCCTGCAAGCGGAGCTGGTACACTTTCTCAGCTCCAAAC  
TACTGTGGCGAGTTGACAATGCTGGCGCATGATGAGTGTGACGAGACCTCATGTGCTTTCCAGA  
TCCTCAAGCCCCCGACAAGAACAGGGAGTACGGGAGTTCAGTGGCCTGAAACCTGGAGGGCGACC  
CATCACCCCCACCCGCAATCGCAAAGCCAAGAAATAGCCCCCGCACACCCACCTGTGCCCAAGATGA  
TGGATTGATTGACAGAAATCATGCTGCCATGCTGGGGGGGTCAACCCGACCCCTAACGGCCACCTGT  
CACGGGGAACATGGAGCCTGGTGTATTTCTTTTAAATGAATCAATAGCAGCGTCCAGTCC  
CCCAGGGCTGCTCCTGCCATGCGGTACTGTGAGCAGGATCTGGGCCAGGGCTGCAGCTCAGG  
GCAACGGCAGGCCAGGTGCTGGGTCTCAGCCGTCTGGCCTCAGGCTGGCAGCCGGATCTGGGCA  
ACCCATCTGGTCTTGAATAAAGTCAAAGCTGGATCGGAATC

Human PPP1CA mRNA sequence - var2 (public gi: 21758300) (SEQ ID NO: 102)  
AAAAAAAAAAAAAGTTTCCCTCCATGAGGCAGCGCGCCGACCGCCGAAGCATGGTCTCCACCGGGCG  
CCGCCACCTCCAGCGTCCTGGCAGGGAGTTGTGTCGGTAGAGGGCGTCCCCGGGGCCACGCCGA  
CACACACCTGGCAGGGGGAGACTCAGGGGAGGCCACACACTCCCTGCCACGCCACACCCCTACCG  
CCTTGTGCCAAATTCAAGACGACGCCACTGGACATTCAAGAACGCCCCGTCTCCACAGTGTCTTAA  
ATTGCAACAGAGCTCTCCCTGCCACTCCCCATCTGGTCCCCACAGCTCTCCAGGGATTCTACCTACCCAG  
GCTTCCAGGCCAGCTGGGTCCTCCAGGATGGCTCTGCAGCCCTGGGGCTGGCCACCCCTGGT  
GTGCCCCACCCCTAGCATCTCCCTGGGCGCACCTTCCCTACCCACTGGAGCTCCCTGAGGGCAGGGTC  
GAATCTCTCCCTCTCAGTGTAGCCTAGAGCGGGTACTCAGGAGGGTCCGTAAGCCTCCTGACTCTCCA  
GCTTAGAGGCCCTCTGAAGGCGTCAGGCACTAGAGGTTATCAGGAGGCCCTGGGTGAGCTCTACG  
TGGCAAGAGCTCTGGGAAGACGGGAGGTCAAGGCCAGCACAGAGTGGCCAGAGGGCCACACCAA  
CTCCCATCCCTGGTCAGCCCAGGTGGCTCTCACCTGAGCAGGGCAGCTGGCAGGTGGTACACGCTC  
CACCAAGACACTCTCCTCCCTCCAGCTTCTCCAGCAGGCCAGACTGTGTCACCACTGCACCCAGC  
TCTGCCCGGGGTGAGACGCCATGCCCTGCCGCCCCCGCCAGGCCAGCACTGAGCTTACAGCTACCT  
GCAGCAAGGAGGGAAAGGGCCTCTGGACACCACCCAGGTACTGCAGGGTGGGCACCTCCGCCACA  
GGAGCCGTGAGGGCTCGGGCTGGCAAGAATGTACAGCTGACAGAGAACGAGATCCGGCTCTG  
TGAAATCCCAGGAGATTTCTGAGCCAGCCCCTCTGGACTATTGAGTATGGGGTTTCCCTCCGAGAGAAC  
TGACATACACGCCAGTACTAGACCTCTGGCAACTGGAGCTGAGTGTGGACGAGACCTCATGTGCTTCC  
TACCTCTTCTGGGGACTATGTGGACAGGGCAAGCAGTGGGACTCTGGGACCATCTGGCTGCTGG  
ATAAGATCAAGTACCCCGAGAACACTTCTCTGCTCCGTTGGAAACACGAGTGTGCCAGCATCAACCGCAT  
CTATGGTTCTACGATGAGTGAAGAGACGCTACAACATCAAACACTGTGGAAAACCTTCAGTGACTGCTTC  
AACTGCCCTCCATCGGCCATAGTGGACGAAAAGATCTCTGCTGCCACGGAGGCCGTCCCCGGACC  
TGCAGTCTATGGAGCAGATTGGCGGATCATGCCGCCACAGATGTGCCGTGACCAGGGCTGCTGTGA  
CCTGCTGTGGCTCTGACCCCTGACAAGGACGTGAGGGCTGGGGCAGAACGACCGTGGCTCTT  
TTGGAGGCCAGGTGGTGGCCAAGTCTCCACAAGCACGACTTGGACCTCATCTGCCAGCACCAGG  
TGGTAGAAGACGGCTACGAGTTCTTGCCTGGAGGCCAGCTGGTACACTTTCTCAGCTCCAACTACTG  
TGGCAGTTGACAATGCTGGGCCATGATGAGTGTGGACGAGACCTCATGTGCTTCCAGATCCTC  
AAGCCCGCCACAAGAACAAAGGGAAAGTACGGGAGTTCACTGGCTGAACCCCTGGGAGGCCATCA  
CCCCACCCCGCAATTCCGCCAAAGCCAAGAAATAGCCCCCGCACACCCACCTGTGCCCCAGATGATGGAT  
TGATTGTACAGAAATCATGCTGCCATGCTGGGGGGGGTCAACCCGACCCCTCAGGGCCACCTGT  
GGAACATGGAGCCTGGTGTATTTCTTTTAAATGAATCAATAGCAGCGTCCAGTCCAGGGCAA  
GGCTGCTCTGGCTGCCACCTGGGCTGACTGTGAGCAGGATCTGGGGCCAGGTGCTGAGCTCAGGGCAA  
CGGCAGGCCAGGTGCTGGGTCTCAGCCGTCTGGCCTCAGGGCTGGCAGCCGGATCTGGGCAACCC  
ATCTGGTCTTGAATAAAGTCAAAGCTGGATCTCGC

Human PPP1CA mRNA sequence - var3 (public gi: 14124967) (SEQ ID NO: 103)  
GGCTGCCGGAGGGCGGGAGGGCAGGAGCGGGCAGGAGCTGCTGGCTGGAGCGGGCGGCCATGTCC  
GACAGCGAGAACGCTCAACCTGGACTCGATCATCGGGCGCTGCTGGAAAGTGCAGGGCTCGGGCTGGCA  
AGAATGTACAGCTGACAGAGAACGAGATCCGCGTCTGTGCTGAAATCCGGGAGATTTCTGAGCCA  
GCCCATTCCTGGAGCTGGAGGCCACCCCTCAAGATCTGCCGTGACATACACGCCAGTACTACGACCTT  
CTGCCACTATTGAGTATGGGGTTTCCCTCCAGAGAGCAACTACCTCTTCTGGGGACTATGTGGACA  
GGGGCAAGCAGTCTGGAGACCATCTGCCCTGCTGGCCTATAAGATCAAGTACCCGAGAACCTT  
CTGCTCCGTGGAAACACGAGTGTGCCAGCATCAACCGCATCTATGGTTCTACGATGAGTGAAGAGA  
CGCTACAACATCAAACCTGTGGAAAACCTTCACTGACTGCTCAACTGCCATGCCGACCTGG  
ACGAAAAGATCTCTGCTGCCACGGAGGCCCTGCCAGCTGAGGAGATTCCGGGAGATCTGGGCGGAT

Figure 36 part - 58

CATGCGGCCACAGATGTGCCTGACCAGGGCCTGCTGTGACCTGCTGTGGTCTGACCCGTACAAGGAC  
GTGCAAGGCTGGGCGAGAACGACCGTGGCGTCCTTTACCTTGGAGCCAGGTGGTAGAACGCGCTACGAGTTCTTG  
TCCACAAGCACGACTTGGACCTCATCTGCCAGCACACCAGGTGGTAGAACGCGCTACGAGTTCTTG  
CAAGGGCAGCTGGTACACTTTCTCAGCTCCAACTACTGTGGCAGTTGACAATGCTGGGCCATG  
ATGAGTGTGGACGAGACCCATGTGCTCTTCCAGATCCTCAAGGCCCGACAAGAACAGGGAAAGT  
ACGGCAGTTCACTGGCTGAACCCATGCCAGGGCAGGCCACCCATCCCCCGAACAGGGCAAAAGCCAA  
GAAATAGCCCCCGCACACCAACCTGTGCCCCAGATGATGGATTGATGACAGAAATCATGCTGCCATGC  
TGGGGGGGGTCAACCCGACCCCTCAGGCCACCTGTCACTGGGAAACATGGAGCTGGTGTATTTC  
TTTCTTTTAATGAATCAATAGCAGCGTCCAGTCCCCCAGGGCTGCTTCTGCCACCTGCCAG  
CTGTGAGCAGGATCCTGGGGCGAGGCTGCAGCTCAGGGCAACGGCAGGCCAGGTGTGGGTCTCCAGGC  
GTGCTTGGCTCAGGGCTGGCAGCCGATCTGGGCAACCCATCTGGTCTCTGAATAAGGTCAAAGC  
TGGATTCTCAAAAAAAAAAAAAAAA

Human PPP1CA mRNA sequence - var4 (public gi: 33872852) (SEQ ID NO: 104)  
CCTCGTCCGAATTGGCACGAGGAGGGCAGGAGCTGCTGGCTGGAGCGGGCGGCCATGTCC  
GACAGCGAGAACGCTCAACCTGGACTCGATCATGGCGCTGCTGGAAAGTGCAGGGCTCGCGGCCATGGCA  
AGAATGTACAGCTGACAGAGAACGAGATCCCGGGTCTGTGCTGAAATCCGGGAGATTTCTGAGCCA  
GCCCATCTCTGGAGCTGGAGGCACCCCTCAAGATCTGGGTGACATACACGCCAGTACTACGACCTT  
CTGCGACTATTCAGTATGGGTTCCCTCCAGAGAGCAACTACCTCTTCTGGGACTATGTGGACA  
GGGCAAGCAGTCCTGGAGACCATCTGCTGCTGCTGGCCTATAAGATCAAGTACCCCGAGAACCTCTT  
CCTGCTCCGTGGGAAACCACCGAGTGTGCCAGCATCAACCGCATTATGGTTCTACGATGAGTGCAAGAGA  
CGCTACAAACATCAAACGTGGAAACCCCTACTGACTGCTCAACTGCCATGCCATAGTGG  
ACGAAAAGATCTCTGCTGCCACGGAGGCCCTGCTCCCGAACCTGCACTGCTATGGAGCAGATTGGCGGAT  
CATCGGGCCCACAGATGTGCTGACCAGGGCCTGCTGTGACCTGCTGTGGTCTGACCCCTGACAAGGAC  
GTGAGGGCTGGCGAGAACGACCGTGGCGTCTTTACCTTGGAGGGCAGGTGGTGGCAAGTTC  
TCCACAAGCAGACTTGGACCTCATCTGCCAGCACACCAGGTGGTAGAACAGGGCTACGAGTTCTTGC  
CAAGGGCAGCTGGTACACTTCTCAGCTCCAACTACTGTGGCAGTTGACAATGCTGGGCCATG  
ATGAGTGTGGACGAGACCCATGTGCTCTTCAAGATCCTCAAGGCCGACAAGAACAGGGAAAGT  
ACGGCAGTTCACTGGCTGAACCCCTGGAGGCCACCCATACCCCAACCCCGAACAGGGCAAAAGCCAA  
GAAATGCCCGCACACCAACCCCTGTGCCCCAGATGATGGATTGATGACAGAAATCATGCTGCCATGC  
TGGGGGGGGTCAACCCGACCCCTCAGGCCACCTGTACGGGAAACATGGAGCCTGGTGTATTTC  
TTTCTTTTAATGAATCAATAGCAGCGTCCAGTCCCCCAGGGCTGCTTCTGCCACCTGCCAG  
ACTGTGAGCAGGATCCTGGGGCGAGGCTGCAGCTCAGGGCAACGGCAGGCCAGGTGTGGGTCTCCAGC  
CGTCTTGGCTCAGGGCTGGCAGCCGATCTGGGCAACCCATCTGGTCTCTGAATAAGGTCAAAG  
CTGGATTCTCGAAAAAAAAAAAAAAA

Human PPP1CA mRNA sequence - var5 (public gi: 12804878) (SEQ ID NO: 105)  
CAGGAGCGGGCAGGAGCTGGCTGGAGCGGGCGCCATGTCCGACAGCGAGAACGCTAACCT  
GGACTCGATCATGGCGCTGCTGGAAAGTGCAGGGCTGGCGCTGGCAAGAACGCTGACAGAG  
AACGAGATCCGGCTGTGCTGAAATCCGGGAGATTTCTGAGCCAGCCCATTCTGGAGCTGG  
AGGACCCCTCAAGATCTGGGTGACATACACGCCAGTACTACGACCTCTGCACTATTGAGTATGG  
CGGTTCCCTCCGGAGAGAACACTACCTCTTCTGGGGAGACTATGTGGACAGGGCAAGCAGTCTTGGAG  
ACCATCTGCTGCTGCTGGCTATAAGATCAAGTACCCCGAGAACCTCTGCTGCCGGGAACACG  
AGTGTGCCAGCATCAACCGCATCTATGGTTCTACGATGAGTGCAAGAGACGCTACAAACATCAAACGTG  
GAAAACCTTCACTGACTGCTCAACTGCCATCGGCCATAGTGGACGAAAAGATCTCTGCTGC  
CACGGAGGCCCTGCTCCCGGACCTGCACTGCTATGGAGCAGATTGGCGGATCATGCCACAGATGTG  
CTGACCGGGCTGCTGTGACCTGCTGTGGCTGACCCCTGACAAGGACGTGCAAGGGCTGGCGAGAA  
CGACCGTGGCTCTTTACCTTGGAGCCAGGTGGTGGCCAAGTCTCCACAAGCACGACTTGGAC  
CTCATCTGCCAGCACACCAAGGTGAGAACAGGCCAGTGGCTACGAGTTCTTCCAAGCGGAGCTGGACAC  
TTTCTCAGCTCCAACTACTGTGGCAGTTGACAATGCTGGCGCATGATGAGTGTGGACGAGACCC  
CATGTGCTCTTCCAGATCCTCAAGCCGCCGACAAGAACAGGGAAAGTACGGGAGTTCACTGGCTG  
AACCCCTGGAGGGCAGCCATCACCCCAACCCCGAACAGGGCAAGAACATGCCACACCA  
CCCTGTGCCCCAGATGATGGATTGATGACAGAAATCATGCTGCCATGCTGGGGGGGTCAACCCGAC  
CCCTCAGGCCACCTGTCAAGGGGAAACATGGAGCTTGGTGTATTTCCTTTTAATGAATCA  
ATAGCAGCGTCCAGTCCCCCAGGGCTGCTTCTGCCACCTGCCAGTGTGAGCAGGATCTGGGG  
CCGAGGCTGCAGCTCAGGGCAACGGCAGGCCAGGTGTGGCTCCAGCCGTGCTGGCCTCAGGGCTGG  
CAGCCGATCTGGGCAACCCATCTGGTCTCTGAATAAGGTCAAAGCTGGATTCTCAAAAAAAA  
AAAAAAAAAAAAAAA

Human PPP1CA mRNA sequence - var6 (public gi: 34534606) (SEQ ID NO: 106)  
CTTCTTGCTGACGCCAGCGCCACCACCGAGCTGTTTCCCTCATGAGGCAGCGCGGCCACCGC  
CGAAGCATGGTCTCCACCGCGCGCCACCGCCCTCGTGGCGCCGGCCCCAGCCGCGCGGCC

ACAGCCCCCTCCAGCGGCCACGCCCTCCAGACACAGGCCGCGTCAGCTCCAGGGCACTGGCTTCT  
CCAGCAGCGCCAGCACTGTGTCACCACGTGACCCAGCTCTGCCGCCGGTGAGACGCCATGCCCTGCC  
CCCCCGCCAGGCCAGCCACTGAGCTTCACAGCTACCTGCAGCAAGGAGGGAAAGGGGCCCTCTGGACA  
CCACCCCAGGTACTGCAGGGTGGGGACTTCGCCACAGGAGCGTGCAGGGCTGCCCTGGCAAGAA  
TGTACAGCTGACAGAGAACGAGATCCGCCGCTGTGCCTGAAATCCGGAGATTTCTGAGGCCAGCCC  
ATTCTTCTGGAGCTGGAGGCCACCCCTOAAGATCTGCCGTGACATAACGCCAGTACTACGACCTCTGC  
GACTATTGAGATGGGGTTTCCCCTCCGAGAGACAATACCTCTTCTGGGGACTATGTGGACAGGG  
CAAGCAGTCCITGGAGACCATCTGCCCTGCTGCTGCTATAAGATCAAGTACCCCGAGAACTTCTCCTG  
CTCCGTGGGAACCGAGTGTGCCAGCATCAACCCGATCATGGTTCTACGATGAGTGCAAGAGACGCT  
ACAACATCAAATGTGGAAAACCTTCACTGACTGCTCAACTGCCATGCCATGCCGAGATGGCAAG  
AAAGATCTTCTGCTGCCACGGAGGCTGTCCCCGACCTGCAGCTATGGAGCAGATTGGGGATCATG  
CGGGCCACAGATGTGCCCTGACCAGGGCTGTGTGACCTGCTGTGGCTGACCCCTGACAAGGAGCTG  
AGGGCTGGGGAGAACGACCGTGGCTCTTACCTTGGAGCCAGGTGGTAGAAGACGGCTACGAGTTCTG  
CAAGCAGACTGGACCTCATCTGCCAGCACACCAGGTGGTAGAAGACGGCTACGAGTTCTG  
CGGAGCTGGTGGACTTCTCAGCTCCAACTACTGTGGAGGTTGACAATGCTGGCCATGATGA  
GTGTGGACGAGACCCCTCATGTGCTCTTCCAGATCTCAAGGCCGCGACAAGAACAGGGAACTACGG  
GCAGTTCACTGCCCTGAAACCTGGAGGCTGACCCATACCCCAACCCGCAATTGGCCAAGGCAAGAAA  
TAGCCCCCGCACACCACCCGTGCCAGATGATGGATTGATGACAGAAATCATGCTGCCATGCTGG  
GGGGGTCACCCGACCCCTCAGGCCACCTGTACGGGGAAACATGGAGGCTTGGTAGATTTCTT  
TTTTTTAATGAATCAATAGCAGCGTCCAGTCCCCCAGGGCTGCTCTGCCACCTGCCGACTGT  
GAGCAGGATCTGGGGCCAGGCTGAGCTCAGGGCAACGGCAGGGCTGTGGGCTCCAGCGTG  
TTGCCCTCAGGGCTGGCAGCCGATCTGGGCAACCCATCTGGCTCTTGAATAAGGTCAAAGCTGGA  
TTCTC

Human PPP1CA mRNA sequence - var7 (public gi: 30582096) (SEQ ID NO: 107)  
ATGCCGACAGCGAGAACGCTCAACCTGGACTCGATCATCGGCCCTGGAAGTGCAAGGGCTCGCGC  
CTGGCAAGAACATGTACAGCTGACAGAGAACGAGATCCGCCGCTGTGCCTGAAATCCGGAGATTTCT  
GAGCCAGCCATTCTCTGGAGCTGGAGGACCCCTCAAGATCTGCCGTGACATACAGGCCAGTACTAC  
GACCTCTCGCACTATTTGAGATGGGGTTTCCCTCCGAGAGCAACTACCTCTTCTGGGGACTATG  
TGGACAGGGCAAGCAGTCTTGGAGACCATCTGCCCTGCTGCTGGCTATAAGATCAAGTACCCGAGAA  
CTTCTCTGCTCCGTGGAAACCACGAGTGTGCCAGCATCAACGCATCTATGGTTCTACGATGAGTGC  
AAGAGACGCTACAACATCAAACCTGTGAAAAACCTTCACTGACTGCTCAACTGCCATGCC  
TAGTGGACGAAAAGATCTCTGCTGCCACGGAGGCTGTCCCGGACCTGCAGCTATGGAGCAGATTG  
GCGGATCATGCCCTCACAGATGTGCTGACCAGGGCTGTGTGACCTGCTGTGGCTGACCCCTGAC  
AAGGACGTGCAGGGCTGGGGAGAACGACCGTGGCTCTTTACCTTGGAGGCTTGGAGGCTGTTGG  
AGTTCCTCCACAAGCACGACTGGACCTCATCTGCCGAGCACACCGAGTGGAGAACAGGCTACGAGTT  
CTTGCCAAGCGGAGCTGGACACTTTCTGCACTCCAACTACTGTGGAGTTGACAATGCTGGC  
GCCATGATGAGTGTGGAGGACCCCTATGTGCTCTTCAAGCCGCGACAAGAACAGG  
GGAAGTACGGGAGTTCACTGCCCTGAGGGCAACCCATCCCCACCCGCAATTCCGCAA  
AGCCAAGAAATAG

Human PPP1CA mRNA sequence - var8 (public gi: 190515) (SEQ ID NO: 108)  
GGGCAAGGAGCTGCTGGCTGGACGGGGCATGTCGACAGCGAGAACGCTCAACCTGGACTCGATCATCG  
GCCCTGCTGAAAGTGCAGGGCTGCCCTGGCAAGAACATGACAGCTGACAGAGAACGAGATCCGCC  
CTGTGCCCTGAAATCCGGAGATTTCTGAGGCCAGCCATTCTCTGGAGCTGGAGGACCCCTCAAGA  
TCTGCCGTGACATACACGCCAGTACTACGACCTCTGCAGTATTTGAGATGGGGTTTCCCTCCG  
GAGCAACTACCTCTTCTGGGGACTATGTGGACAGGGCAAGCAGTCTTGGAGACCATCTGCCCTG  
CTGGCCTATAAGATCAAGTACCCGAGAACCTCTCTGCCGTGGAAACCACGAGTGTGCCAGCATCA  
ACCGCATCTATGGTTCTACGATGAGTGCAGAGAACGCTACAACATCAAACCTTCACTG  
CTGCTTCAACTGCCATCGCGGCCATAGTGGAGGAAAAGATCTCTGCTGCCACGGAGGCTGTCC  
CGGGACCTGCACTGAGTGGAGGAGATCGGGGATCATGCCCTCACAGATGTGCTGACCAGGGCTG  
TGTGTGACCTGCTGTGGCTGACAGGAGCTGGAGGCTGGGGAGAACGACCGTGGCTCT  
TTTACCTTGGAGGGAGGGAGGGTGGCTGCAAGTCTCTCCACACGAGCAGACTGGACCTCATCTGCCGAGCA  
CACCAGGTGGAGAACGAGCTATGAGTTCTGCCAAGCGGAGCTGGTGCACACTTTCTCAGCTCCCA  
ACTACTGTGGCGAGTTGACAATGCTGGGCCATGATGAGTGTGGAGGACCCCTCATGTGCTCTTCCA  
GATCCCTCAAGCCGCGACAAGAACAAAGGGAGTACGGGAGTTCACTGCTGAGGCTGAAACCTGGAGGCC  
CCCACCAACCCACCCGCAATTCCGCAAAGCAAGAAATAGCCCCGACACCACCCGTGCCCCAGAT  
GATGGATTGATGTACAGAAATCATGCTGCCATGCTGGGGGGGTGACCCCTAAGGGCCACCT  
GTCACGGGGAGACATGGAGGCCCTGGTGTATTTCTTTCTTTAATGAATCAATAGCAGCGTCCAGT  
CCCCCAGGGCTGCTCTGCCCTGACCTGCCGTACTGTGAGCAGGATCTGGGGCGAGGCTGAGCTCA  
GGGCAACGGCAGGCCAGGTGCTGGTCTCCAGCCGTGCTGGCCTCAGGCTGGCAGCCGGATCTGGGG  
CAACCCATCTGGTCTCTTGAATAAGGTCAAAGCTGG

Human PPP1CA mRNA sequence - var9 (public gi: 190280) (SEQ ID NO: 109)  
CGGCCTGGCAAGAACATGTACAGCTGACAGAGAACGAGATCCGGCTCTGCGCTGAAATCCGGAGATT  
TTCTGAGCCAGCCCATTCTCTGGAGCTGGAGGCCACCCCTCAAGATCTGCGGTGACATACACGGCCAGTA  
CTAGGACCTTCTGCGACTATTTGAGTATGGAGGTTCCCTCCCGAGAGCAACTACCTCTGGGGAC  
TATGTGGACAGGGCAAGCAGTCCTGGAGACCATCTGCCCTGCTGGCTGGGCTATAAGATCAAGTACCCCG  
AGAACCTCTCTGCTCCGGAAACCAACCGAGTGTGCGAGCATCAACCGATCTATGGTTCTACGATGA  
GTGCAAGAGACGCTACAACATCAAACACTGTGAAAACCTCACTGACTGCTCAACTGCCCTGCCATCGCG  
GCCATAGTGGACGAAAAGATCTCTGCTGCCACGGAGGCCCTGCACTGAGTGTGGAGCAGA  
TTCGGCGGATCATGCCCGGACAGATGTGCTGACCAAGGGCTGCTGTGACCTGCTGTGGCTGACCC  
TGACAAGGACGTGCAAGGGCTGGGGAGAACGACCGTGGCTCTCTTACCTTGGAGCCGAGGTGGTG  
GCCAAGTTCCTTACAAGCACGACTGGACCTCATCTGCCGAGCACACCAGGGTAGAAGACGGCTACG  
AGTTCTTGCCAAGCGGCACTGGTGCACACTTTCTCAGCTCCAACTACTGTGGCAGTTGACAATGC  
TGGCCCATGATGAGTGTGGACGAGACCCATGTGCTCTTCAGATCTCAAGCCGCCAACAGAAC  
AAGGGGAAGTACGGGCACTTCAGTGGCTGAACCTGGAGGGCACCCATCACCCACCCGCAATTCCG  
CCAAAGCCAAGAAATAGCCCCCGCACACCACCTGTGCCCCAGATGATGATTGATTGACAGAAATCAT  
GCTGCCATGCTGGGGGGGGTCACCCGACCCCTCAGGCCACCTGTACGGGGAACATGGACCTGGTG  
TATTTCTTTCTTTAATGAATCAG

Human PPP1CA protein sequence - var1 (public gi: 298964) (SEQ ID NO: 261)  
MSDSEKLNLDSTIIGRLLEGSRVLTPHCAPVQGSRPKGKVQLTENEIRGLCLKSREIFLSQPILLEAPL  
KICGDIHGQYYDLLRLFEYGGFPESNYLFLGDYVDRGKQSLETICLLLAYKIKYPENFFLRRGNHECAS  
INRIYGFYDECKRRYNIKLWKTFTDCNCLPIAAIVDEKEIFCCHGGLSPDLQSMEQIRRIMRPTDVPDQG  
LLCDLLWSDPDKDVQGWGENDRGVSVTFGAEVVAKFLHKHDLDLICRAHQVVEDGYEFFAKRQLVTLFSA  
PNYCGEFDNAGAMMSVDETLMCSFQILKPADKNKGKYGQFSGLNPGRPITPPRNSAKAKK

Human PPP1CA protein sequence - var2 (public gi: 190516) (SEQ ID NO: 262)  
MSDSEKLNLDSTIIGRLLEVQGSRPKGKVQLTENEIRGLCLKSREIFLSQPILLEAPLKICGDIHGQYY  
DLLRLFEYGGFPESNYLFLGDYVDRGKQSLETICLLLAYKIKYPENFFLRRGNHECASINRIYGFYDEC  
KRRYNIKLWKTFTDCNCLPIAAIVDEKEIFCCHGGLSPDLQSMEQIRRIMRPTDVPDQGLLC DLLWSDPD  
KDVGWGENDRGVSVTFGAEVVAKFLHKHDLDLICRAHQVVEDGYEFFAKRQLVTLFSAPNYCGEFDNAG  
AMMSVDETLMCSFQILKPADKNKGKYGQFSGLNPGRPITPPRNSAKAKK

Human PPP1CA protein sequence - var3 (public gi: 190281) (SEQ ID NO: 263)  
RPGKVNQLTENEIRGLCLKSREIFLSQPILLEAPLKICGDIHGQYYDLLRLFEYGGFPESNYLFLGD  
YVDRGKQSLETICLLLAYKIKYPENFFLRRGNHECASINRIYGFYDECKRRYNIKLWKTFTDCNCLPIA  
AAIVDEKEIFCCHGGLSPDLQSMEQIRRIMRPTDVPDQGLLC DLLWSDPDKDVQGWGENDRGVSVTFGAEVV  
AKFLHKHDLDLICRAHQVVEDGYEFFAKRQLVTLFSAPNYCGEFDNAGAMMSVDETLMCSFQILKPADKN  
KGKYGQFSGLNPGRPITPPRNSAKAKK

Human PPP1CA protein sequence - (public gi: 35451) (SEQ ID NO: 395)  
MSDSEKLNLDSTIIGRLLEVQGSRPKGKVQLTENEIRGLCLKSREIFLSQPILLEAPLKICGDIHGQYY  
DLLRLFEYGGFPESNYLFLGDYVDRGKQSLETICLLLAYKIKYPENFFLRRGNHECASINRIYGFYDEC  
KRRYNIKLWKTFTDCNCLPIAAIVDEKEIFCCHGGLSPDLQSMEQIRRIMRPTDVPDQGLLC DLLWSDPD  
KDVGWGENDRGVSVTFGAEVVAKFLHKHDLDLICRAHQVVEDGYEFFAKRQLVTLFSAPNYCGEFDNAG  
AMMSVDETLMCSFQILKPADKNKGKYGQFSGLNPGRPITPPRNSAKAKK

Human PPP1CA pray sequence - var1 (SEQ ID NO: 110)  
CCGCCTGGTNCTACCCATGACNCACNTACCANTATTACGTCTACATATGGCTCATGGCAGGCCAGTTGAA  
ATTCACACACAATACAAGTGCCTCATGCACACGCCAGAAGAAGGNCATTTGNTTGNNAACTTNATTA  
TAGGGCNAGNGCCCCNTGGANCCNTAACACNTCCNNTACAGCTCATATGGCCATGGAGGCCAG  
TGAATTCACCCAAGCGGGTATCAACGACAGTGGCATTATGGCGGGCAGTGGCCANAACCCCTGGAG  
GCCACCCATACCCACCCGCAATCCGCCAAGCAAAGAAATAGNNGGCGCACACCACCTGTGCCT  
TNNATGATGGATTGATTGTACAGAAATCATGCTGCCATGCTGGGGGGGG

Unigene Name: PRKAR1A Unigene ID: Hs.280342

Human PRKAR1A mRNA sequence - var1 (public gi: 34530409) (SEQ ID NO: 111)  
ATCGCAGAGTGGAGCGGGCTGGAGCAAAGCGCTGAGGGAGCTCGGTACGCCGCCCTCGCACCCGCA

GCCTCGCCCCGCCGCCCAGAGAACCATGGAGTCTGGCAGTACCGCCGCCAGTGAGGAGGC  
 ACGCAGCCTTCGAGAATGTGAGCTCTACGTCAGAACAGCATAACATTCAAGCGCTGCTAAAGATTCTATT  
 GTGCAGTTGTGCACTGCTCGACCTGAGAGACCCATGGCATTCTCAGGGAATACITTGAGAGGAGGAGGC  
 AAAACAGATTCAAATCTGAGAAAGCAGGCAGTCAGACTCAAGGGAGGATGAGATTTCTCCTCCT  
 CCACCCAACCCAGTGGTTAAAGGTAGGAGGCGAGGGTGTATCAGCGCTGAGGTCTACACGGAGGAAG  
 ATGCGGCATCTATGTTAGAAAGGTTATACAAAAGAATACAAGACAATGGCCCTTAGCCAAAGCCAT  
 TGAAAAGAATGTGCTGTTTCACATCTGATGATAATGAGAGAAGTGTATTTTGATGCCATGTTTCG  
 GTCTCCTTATCGCAGGAGAGACTGTGATTCAAGGTGATGAAGGGGATAACTCTATGTGATTGATC  
 AAGGAGAGACGGATGTCTATGTTAACAACTGAATGGCAACAGTGTGGGAAGGAGGAGCTTGGAGA  
 ACTTGCTTGTGTTATGGAAACACCGAGAGCAGCACTGTCAAAGCAAAGACAATGTGAAATTGTGGGC  
 ATCGACCGAGACAGCTATAGAAGAACCTCATGGAAAGCACACTGAGAAAGCGGAAGATGTATGAGGAAT  
 TCCTTAGTAAAGTCTCTATTTAGAGTCTCTGGACAAGTGGGAAAGCTTACGGTAGCTGATGCCATTGGA  
 ACCAGTGCAGTTGAAGATGGGAGAAAGATTGTGGTCAGGGAGAACAGGGGATGAGTTCTTCATTATT  
 TTAGAGGGTCAGCTGCTGCTACACGTCGGTCAGAAAATGAAGAGTTGTGAAAGTGGGAAGATTGG  
 GGCCTCTGATTATTTGGTGAATTGCACTACTGATGAATCGTCCTCGTGCACAGTTGTGCTCG  
 TGGCCCTTGAGTGCCTTAAGCTGGACCTAGATTGAACTGTTCTGGCCATGCTCAGACATC  
 CTCAAACGAAACATCCAGCAGTACAACAGTTGTGCACTGCTGTAATCTGCTCCTGTGCTC  
 CCTTTCTCCTCCCATGCTTCACTCATGCAAACACTGCTTATTTCTACTTGCAAGGCCAA  
 GTGGCCACTGGCATTGCACTGCTGCTGTTATATATTGAAAGTTGCTTTATTGCAACCATTTCAT  
 TTGAGGCACTTAACAAATGCTCATACAGTTAAATAAATAGAAAAGAGTTCTATGGAGACTTTGCTGTTA  
 CTGCTTCTCTTGAGTGCAGTTAGTATTCCCTGGGAGCTGAGTGCCTGAAAGTGTGAGGGCAGAT  
 CCCAGCACCTATTGAATTACATAGAGTAATGATGTTAACAGTGCAGGAAAGTGTGAGGAACTAA  
 TTGTCAGCTTAAAGCTATTAGACTGTGGCCATATATGCTGATTCTTGTGAGAATAATGGTTCT  
 CATTAACACTCTAAAGGTTAGGAAATGGATATAGAAAATCTTAGTATAGTAGAAAGACATCTGCTGTA  
 ATTAACACTTAGTTAAGGGTGGAAATGCCATTGGCTAATTATCAATGGGATATGATTGGTCAGTT  
 TTTTTTTTCCAGACTGTGTTGCAAGCTAATCTGCTGGTTTATTATATCTTGTGTTATTAAATG  
 TTCTCTCCAATTCTGAAACTTTGAGTATGGCTATCTACCTGCTTTAAGTTGAAACTAACT  
 CATAGATTGCAAATATTGGTTAGTATTAACTACATCTGCTCGGCTACAAATTCCGATTAGACCTTTA  
 TCCAGCTAGGCCAATAATTGATCAGATGCTGAATTGAGAATAAGAATTGAGGCTACATTCTGGTT  
 GTTAATTCTAGAGCGTTGGTTAAAGTATGTCCTCAGCTGACTCCAGTATAATCTCCTCTGCTCATTAAA  
 CTGATTCCAGGAGATTGGATTGCTGTGACTAGATACAGATGGAGCAAATGCTTAACAGAGAAATAGAG  
 GTGATGCTGCTAAAGGGAGAAATGCCAGGGGACAAAGTCTGAGTGGGAATTTCCTCGTGAATTCA  
 CTGGGGCATGAGATTGGAGAAGTTTTACTTGGTTAGTCTTCTTCTCTTCTTCTTCTTCTTCT  
 TAGAATTCTGGTGGGTTAGGGTATAATGCTGTGTTGCTCAATTGGCTGAAAGGCTAT  
 CCTGCTGAAAGTCTGCTTCTCTATCTAGCATTATTCTCTGGCAAACCTTTCTTCTTCTTCT  
 AAGTAAACTTGTGATTGAGTCTTAACTGTATTCCAGCCTTATGTGTTACATTCTGAA  
 TGATACCCAAACAGTTTATTATTAAACAAAATTCTACAGTTCTGTAATGTAGGCACCTT  
 ATTTCATTGTGATTATATATAAGGTAATGAGGTTATATTGGGAGTGACTGCAAGCATTCTGCA  
 CTGTGTGCAACTAACTGACTCTGTTATTGATCCCTCTGCCCCCTCCAGGTAATTAAATGGTCA  
 TGGTAGATTCTCATAGATTGAAAACCTTTAGGTTGTTACCAAGTATGAAGTATAATGGGAA  
 GAGGTTTATTACATTAGGGTGGTAAGAAAGCCACCTGTTACAAATTCTTAAATTCCAAAATAA  
 TCTATATTAAATGAGGTTCTGATCTGACTTTGTTAGCTACCTTTTATATTAAATTAAAAA  
 ATGAAAATTATGTTCTACAAGCTTAAAGCTTGATTGATCTTGTGTTAAATGCCAAAATGTACTTAAAT  
 GAGTTACTTGAATGCCATAAAATTGCAAGTTCTGATGTATGTTAAATCATGCTCATGTATATTAGTTA  
 CGTATAATGCTTCTGAGTGAAGTTACTCTTAACTGTTAAATCATGCTCATGTATATTAGTTA  
 CCTCTGTTAGTTTAATTAAAGCTTAAAGATAAGTCTACATTAAACATGATCACATCTAAAGCTT  
 ATCTTGTTGTAATCTAAGTATATGTGAGGAAATGAGATTACTGCTCTAGAAAGTATAGATGG  
 TTTAAAGTCATTATTCTGGCTTGGTAAGTGAATTGAGATTACTGCTCTAGAAAGTATAGATGG  
 CCAAGGACCGTTTGTATTGCTTCTGATTACAGTGTGATTACCATGTTGCTAATATACTTTTT  
 TGTATAGATTGTCTTAATGGTAGGTCAAGTAATAAAAGAGATGAAATAATT

Human PRKAR1A mRNA sequence - var2 (public gi: 4884279) (SEQ ID NO: 112)  
 TATTTCCAGCCTTATGTGTTACATTATTCAATGATACCCAAACAGTTATTTTATTATTTTAAAC  
 AAAATTCTACAGTTCTGTAATGCTAGGCACCTTATTTCATTGTGATTATATATAAGGTAATGTAGGGT  
 TATATTGGGAGTGACTGCAAGCATTCTCCATCTGTCAGCAACTAAGTCTGTTATTGATCCCTC  
 TCCTGCCCTTCCAGGTAATTAAATTGGTCATGGTAGATTCTTCTAGATTGAAAACCTTTAGG  
 TTGTTACCAAGTATGAAGTATAAACTGGGAAGAGGTTTATTACATTAGGGTGGTAAGAAAGCC  
 ACCTTGTACAAATTCTTAAATTCCAAAATACTATATTAAATGAGGGTTCTGATCTGACTTTGTC  
 TTTAGCTACCTTTTATATTAAATTAAAGTAAATGCAAGCTTACAGCTTAAAGCTTAAAGCTT  
 GATCTTGTAAATGCCAAATGTACTTAAATGAGTTACTGAGTAAATGCTTACAAATTGCAAGTT  
 ATGTATATAATCATGCTCATGTATATTAGTTACGTATAATGCTTCTGAGTTACTCTTAAATC  
 ATTGGTTAAATCATTGGCTTGGCTTACTCCCTCTGAGTTAAATTAAATTAAACTTAAAGATAAG  
 TCTACATTAAACATGATCACATCTAAAGCTTATCTTGTGAAATCTAAGTATATGTGAGAAATCAGAA

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TTGGCATAATTGTCTTAGTGATATTCAAGGCTTAAAGTCATTATTCTGGCTGGTAAGTGAATT  
TATGAGATTACTGCTAGAAAGTATAGATGGCAAAGGACCGTTATGCTTCTGATTACCACT  
CTGATTATACCATGTGTGCTAATATACTTTTTGTTAGATTGCTTAATGGTAGGTCAAGTAATAAA  
AAGAGATGAAATAATTTAAAAAAAAAAAAAA

Human PRKAR1A mRNA sequence - var3 (public gi: 33636720) (SEQ ID NO: 113)  
GGTGGAGCTGTCGCTAGCCGCTATCGCAGAGTGGAGCGGGCTGGGAGCAAAGCGCTGAGGGAGCTCGG  
TACGCCGCCCTCGCACCCGAGCCTCGGCCGCCGCCCCGCTCCAGAGAACATGGAGCTCGC  
AGTACCGCCGCACTGAGGGAGGCAGCAGCAGCTCGAGAATGTGAGCTACAGTCAG  
AAGCGCTGCTAAAGATTCTATTGTGCACTGTCAGCTCGACCTGAGAACAGCCATGGCATTCTCAG  
GGAATACTTGAGAGGTTGAGAAGGAGGAGGCAAAACAGATTCAAGATCTGAGAACAGCCATGGCATTCTCAG  
ACAGACTCAAGGGAGGATGAGATTCTCCTCCACCCAACCAGTGGTTAAAGGTAGGAGGCGACGAG  
GTGCTATCAGCGCTGAGGTACACCGAGGAAGATGCGGCATCCTATGTTAGAAAGGTTATACAAAAGA  
TTACAAGACAATGGCCCTTACCCAAGCATTGAAAAGAATGTGCTGTTTACATCTGATGATAAT  
GAGAAGTGTATTTGATGCCATGTTTCGGCTCCTTATCGCAGGAGAGACTGTGATTAGCAAG  
GTGATGAAGGGGATAACTCTATGTGATTGATCAAGGAGAGACGGATGTCTATGTTAACATGAATGGC  
AACCACTGTTGGAAAGGGAGCTTGGAGAACCTGCTTGTGTTATGGAACACCGAGAGCAGCCACT  
GTCAAGCAAACACAAATGTGAAATTGCGGACATCGACCGAGACAGCTATAGAAGAACATCTCATGGAA  
GCACACTGAGAAAGCGGAAGATGTATGAGGAATTCTTAGTAAGTCTCTATTAGAGTCTCTGGACAA  
GTGGGAACGCTTACGGTAGCTGATGCACTGGAAACCAGTCAGCTTGAAGATGGGAGAACAGATTGTGGT  
CAGGGAGAACCAAGGGATGAGTTCTCATTAAATTAGAGGGGTCAGCTGCTGCTACAACGTCGGTCAG  
AAAATGAAGAGTTGTTGAAGTGGGAAGATTGGGGCCTCTGATTATTTGGTGAATTGCACTACTGAT  
GAATCGCTCTCGTGTGCACTGGCACAGTGTGCTCGGCCCCCTTGAAGACATCCAGCAGTACAACAGTTGT  
TTTGAACGTTCTGGCCATGCTGAGACATCCTCAAACAGAACATCCAGCAGTACAACAGTTGT  
CACTGCTGCTGAAATCTGCCCTGTGCCCCCTTCTCCTCTCCCCTGCTGTTAT  
AAACTGCTTATTTCCCTACTTGAGCGCCAAGTGGCCACTGGCATCGCAGCTCTGCTGTTAT  
ATTGAAAGTTGCTTTATTGCAACATTTCATTTGAGCATTAACTAAATGCTCATACACAGTTAAATA  
AATAGAAAGAGTTCTATGGAGACTTTGCTGTTACTGCTCTTTGCACTGTTAGTATTACCCCTGG  
CAGTGAGTGCCATGCTTTTGCTGAGGGCAGATCCCAGCACCTATTGAATTACCATAGAGTAATGATGTA  
ACAGTGAAGATTTTTTAACTGACATAATTGTCAGTTAAAGCTGTTAGACTGTGGCCATATA  
TGCTGTTATTCTTGAGAATAATGGTTCTCATTAACAGTTAAAGATTAGGGAAATGGATAAGAAA  
ATCTTAGTATAGTAGAAAGACATCTGCTGTAATTAAACTAGTTAAGGGTGGAAAATGCCATTITG  
CTAATTATCAATGGATATGATTGGTCAGTTTTCTCAGGTTGTTGCTTCCAGAGTTGTTGCTTCCAAAGCTAATCTG  
CCTGGTTTATTATATCTGTTATTAACTGTTCTTCTCCAACTCTGAATACACTTTGAGTATGGCTATC  
TATACCTGCTTTAAGTTGAAACTAACTCATAGATTGCAATATTGGTTAGTATTAACTACATCTG  
CTCGGCTCACAAATTCCGATTAGACCTTATCCAGCTAGTGCCTAAAGTATGCTCTCAGCTG  
AATAAGAATTGAGGTCTACATTCTGGTTAAATTAGAGCCTTGGTTAAAGTATGCTCTCAGCTG  
ACTCCAGTATAATCTCTCGCTCATTAACAGTGAAGGAGATTGGATTGCTGACTAGATACAGA  
TGGAGCAAATGCTAACAGAGAAATAGAGGTGATGCTGCTAAAGGGAGAAATGCCAGGGACAAAGTT  
CAGTGCGGGATTTCCTCGTGCACATTCACTGGGCATGAGATTGGAGAAGTTTACTTTGGTT  
TAGTCTTTCTCCTTTTATTCACTGCTAGAATTCTGGTGGTTGATGGTAGGGTATAATGTT  
GTGGTCTCAATTGGTCTGAAAGGCTATCTGCGGAAAGCTGCTTCTCTATCTAGCATTATTCT  
CTGGCAAACCTTTCTTCTTTCTTTAAAGTAAACTTGTTGAGTATTGAGTCTTAACGTATTCACTG  
TTTCCAGCTTATGTGTTACATTATCCAATGATAACCAACAGTTATTATTAAACAAA  
ATTTCACAGTTCTGTAATGAGGCACCTTATTCTGATTATATAAGGTAATGTAGGGTT  
ATTGGGAGTGACTGCAAGCATTTCATCTGCTGCAACTAACTGACTCTGTTACTCTTCC  
TGCCCTTCCCAGGTAAATTAAATTGGTCTGTTGAGATTCTTCTGTTGAGTATTGAAACACTTTAGGTTG  
TTACCAAGTATGAGTATAAACTGGGAAGAGGTTTATTACATTGGTGTGTTGAGGTT  
TTGTTACAAATTAAATTCCAACAAATTAAAGGTTCTGATCTGACTTTGT  
AGGTTACCTTATTTAAATTAAAGGTTCTGATCTGTTGAGGTT  
CTTGTGTTAAATGCCAAATGACTTTAAATGAGTTACTTAAAGTGAATGCCATAAAATTGCACTT  
TATATAATCATGCTCATGTTATTAGTTACGTTACGTTAACTGCTTCTGAGTGAGTTACTCTTAAATCATT  
TGGTTAAATCAATTGGCTGCTGTTACTCCCTCTGTTGAGTTTAAATTAAAACCTTAAAGATAAGTCT  
ACATTAACAAATGATCACATCTAAAGCTTATCTTGTGTTAATCTAAGTATATGTGAGAAATCAGAATTG  
GCATAATTGCTTAGGTTGATATTCAAGGCTTAAAGTCATTATTCTGGGCTTGTGTTGAGTGAATT  
GAGATTACTGCTCTAGAAAGTATAGATGGCGAAAGGACCGTTTGTATTGCTTCTGATTACCACTG  
ATTATACCATGTGTGCTAATATACTTTTTGTTAGATTGCTTAATGGTAGGTCAAGTAATAAAAG  
AGATGAAATAATTAAAAAAAAAAAAAA

Human PRKAR1A mRNA sequence - var4 (public gi: 1526989) (SEQ ID NO: 114)  
GCTGGGAGCAAAGCGCTGAGGGAGCTCGGTACGCCGCCCTCGCACCGCAGCCTCGGCCGCCGCC  
CCCGTCCCCAGAGAACATGGAGCTGGCAGTACCGCCGCCAGTGGAGGAGGCACGCCCTCGAGAACATG

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TGAGCTCTACGCCAGAAGCATAACATTCAAGCGCTGCTAAAGATTCTATTGTGCAGTTGTGCACTGCT  
CGACCTGAGAGACCCATGGCATTCTCAGGGAATACTTGTAGAGGTTGGAGAAGGAGGAGGAAAACAGA  
TTCAGAATCTGAGAAAGCAGGCACTCGTACAGACTCAAGGGAGGATGAGATTCTCCCTCCACCCAA  
CCCAGTGGTTAAAGTAGGGCGACGGGTGCTATCAGCGCTGAGGTCTACACGGAGGAAGATGCGGCA  
TCCTATGTTAGAAAGGTTATACAAAAGATTACAAGACAATGCCCTTAGCCAAGCCATTGAAAAGA  
ATGTGCTGTTACATCTTGATGATAATGAGAGAAGTGTATTTTGATGCCATGTTTCGGTCTCCTT  
TATCGCAGGAGAGACTGTGATTCAAGGTGATGAGGGGAAACTTCTATGTGATGCAAGGAGAG  
ACGGATGTCTATGTTAACATGAATGGCAACAGTGTGGGAAGGAGGAGCTTGGAGAACTTGCTT  
TGATTTATGGAACACCGAGGAGCAGGCACTGTCAAAGCAAAGACAATGTGAAATTGTGGGCATCGACCG  
AGACAGCTATAAGAAGAACATCTCATGGAAAGCACACTGAGAAAGCGGAAGATGTATGAGGAATTCTTAGT  
AAAGTCTCTATTAGTCTCTGGACAAGTGGAACGCTTACGGTAGCTGATGCAATTGGAAACAGTGC  
AGTTGAAGATGGGAGAACAGATTGGTGTGAGGGAGAACAGGGGATGAGTTCTCATTATTTAGAGGG  
GTCAGCTGCTGGCTACAACGTGGTCAGAAAATGAAGAGTTGTGAGTGGGAAGAATTGGGCTTCT  
GATTATTTGGTGAATTGCAACTACTGATGAATCGCCTCGTGTGCCACAGTTGTGCTCGTGGCCCT  
TGAAGTGCCTTAAGCTGGACCGACCTAGATTGAACTGTTCTGGCCCATGCTCAGACATCCTCAAACG  
AAACATCCAGCAGTACAACAGTTGTCACTGTCGAAATCTGCCCTCTGTGCCCTCCCTTTCT  
CCTCTCCCCAATCCATGCTCACTCATGCAAACGCTTATTTCCCTACTTGCAAGGCCAAGTGGCCAC  
TGGCATCGCAGCTTCTGTGTGTTATATATTGAAAGTGTCTTATGACCATAATTCAATTGAGCA  
TTAACATAATGCTCATACACAGTTAAATAGAAGAACAGTTATGAGGAGACTTGTGTTACTGCTCT  
CTTTGTGAGTGTAGTATTGCTTACCTGGGAGTGTGAGTGCATGCTTTGGTGAAGGAGATCCAGCACC  
TATTGAATTACCATAGAGTAAATGATGAAACAGTGTGAAAGATTTTTAACTGACATAATTGTCAGT  
TATAAGCGTATTAGTGTGGCCATATGTCGTTTGTGAGAATAATGGTTCTCATTAACACT  
CTAAAGATTAGGAAATGGATATAGAAAATCTTAGTATAGAAAAGACATCTGCTGTAAATTAAACTAG  
TTAAGGGTGGAAAATGAAAATTGGCTAATTATCAATGGGATATGATTGGTTCAGTTTTTTTCC  
AGAGTTGTGTTGCAAGCTAATCTGCCCTGGTTATTATATCTTGTATTAAATGTTCTCTCCAAATT  
CTGAAATACTTTGAGTATGGCTATCTACCTGCCCTTAAGTTGAACACTAATGCAAGTGC  
TTGGTTAGTATTAACTACATCTGCTCGGCTCACAAATTCCGATTAGACCTTATCAGCTAGTGC  
ATAATTGATCAGATGCTGAATTGAGAATAAGAATTGAGGTCTACATTCTGGTGTAAATTAGAGCGT  
TTGGTTAAAGTATGTCCTCAGCTGACTCCAGTATAATCTCCCTGCTCATTAAACTGATTCCAGGAGAT  
TGGATTGCTGTGACTAGATACAGATGGGAGCAAATGCTAACAGAGAAAATAGGGTGTGCTGCTAAAG  
GGAGAAATGCCAGGGGACAAGTTCAGTGTGGGAATTCCCGTGTGACATTCACTGGGCATGAGATT  
TTGGAAGAAGTTTTACTTGGTTAGTCTGTTGCTCAAATTGGTGTGAAAGGCTATCTGCTGAAAGTCCTG  
TTGATGGTAGGGTATAATGTCGTTGCTCAAATTGGTGTGAAAGGCTATCTGCTGAAAGTCCTG  
CTTCTCTATCTAGCTTACAGTCTGTTGCTCAAATTGGTGTGAAAGGCTATCTGCTGAAAGTCCTG  
TGAGCTTAACGTATTCTAGTATTCTCAGCTTACAGTCTGTAATGTAGGCACTTTATTTCATTGTGATT  
ATTTTATTATTTAAACAAATTTCACAGTCTGTAATGTAGGCACTTTATTTCATTGTGATT  
ATATATAAGGAATGTAGGGTTATAATTGGGAGTGTGACTGCAAGCATTTCATCTGCTGCAACTAATC  
GACTCTGTTATTGATCCCTCTGCCCTTCCAGGTAAATTAAATTGGTGTGAAAGTATTTCAT  
TAGATTGAAAAACTTTAGGTTGTTACCAAGTATGAAGTATAATCTGGGAAGGAGTTTATTACAT  
TTAGGGTGGGTAAGAAAGCCACCTGTTACAAATTTCAAAATAATCTATATTAAATGAGG  
GTTCTGATCTGACTTTGTGTTAGCTACCTTATATTAAAAATAATGAAAATTATGTTCT  
TACAAGCTTAAAGCTGATTGATCT

Human PRKAR1A mRNA sequence - var5 (public gi: 1526988) (SEQ ID NO: 115)  
GGCAGAGTGGAGCGGGGCTGGGAGCAAAGCGCTGAGGGAGCTGGTACGCCGCCCTCGCACCCGAGC  
CTCGCGCCCGCCGCCGCTCCCAAGAGAACCATGGAGCTGGAGTCTGGCAGTACGCCGCCAGTGAGGAGGCAC  
GCAGCCTCTGAGAAATGTGAGCTACTGTCAGGCAAGCATAACATTCAAGCGCTGCTCAAAGATTCTATTGT  
GCAGTTGTGCACTGTCGACCTGAGGAGACCATGGCATTCTCAGGGAAACTTTGAGAGGTTGGAGAAG  
GAGGAGGCAAACGATTGAGAAATCTGAGGAGGAGACTGTCAGCAAGGTGATGAAGGGATAACTCTATGT  
CTCCTCTCCACCCAACCCAGTGGTTAAAGGTAGGAGGCGACGAGGTCTATCAGCGCTGAGGTCTACAC  
GGAGGAAGATGCGGATCCTATGTTAGAAAGGTATACCAAAAGATTACAAGACAATGCCGCTTAGCC  
AAAGCCATTGAAAAGAATGTGCTGTTACATCTGATGATAATGAGAGAAGTGTATTTTGATGCC  
TGTGTTCTGCTCTTATCGCAGGAGAGACTGTGATTCAAGCAAGGTGATGAAGGGATAACTCTATGT  
GATTGATCAAGGAGAGACGGATGTCTATGTTAACATGAATGGCAACAGTGTGTTGGGAAGGAGGGAGC  
TTGGAGAACTTGCTTGTATTATGGAACACCGAGAGCAGCCACTGTCAAAGACAATGTGAAAT  
TGTGGGGCATCGACCGAGACAGCTATAGAAGAATCCTCATGGGAAGCACAATGAGAGAAGCGGAAGATGTA  
TGAGGAATTCTTAGTAAAGTCTCTATTAGAGTCTCTGGACAAGTGGGAACGTTACGGTAGCTGAT  
GCATTGGAACAGTGCAGTTGAAGATGGCAGAAGATTGTTGGTGCAGGGAGAACCCAGGGATGAGTTCT  
TCATTATTTAGGGGCTCTGATTATTGGTGAATTGCACTACTGATGAAATCGTCTCTGCTGCCACAGTT  
AAGATTGGGGCTCTGATTATTGGTGAATTGCACTACTGATGAAATCGTCTCTGCTGCCACAGTT  
GTTGCTGCTGGCCCTTGTGAGTGTGTTAAGCTGGACCGACCTAGATTGAAACGTGTCTGAAATCTGCTCC  
CAGACATCCTCAAACGAAACATCCAGCAGTACAACAGTTGTGTCAGTCTGCTGAAATCTGCTCC  
TGTGCTCCCTTCTCTCCATGCCACTCATGCTTACTCATGCAAACGCTTATTCCCTACTTG

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AGCGCCAAGTGGCCACTGGCATCGCAGCTCCTGTCGTTATATATTAAAGTTGCTTTATTGCACCAT  
TTCAATTGGAGCATTAACTAAATGCTACACAGTTAAATAAGAAAAGAGTTCTATGGAAAAAAA  
AAAAAA

Human PRKAR1A mRNA sequence - var6 (public gi: 9956010) (SEQ ID NO: 116)  
AACTGACTCTGTTATTGATCCCTCTCTGCCCTTCCCAGGTAAATTAAATTGGTCATGGTAGATTTT  
TTCATAGATTTGAAAAACTTTAGGTTGTTACCAAGTATGAAGTATAAAATCTGGGAAGAGGTTTATT  
ACATTTAGGGTGGTAAGAAAGCCACCTGTTACAATTTAATTTCAAATAATCTATATTAAAT  
GAGGGTTCTGATCTGACTTTGTTAGCTACCTTTATATTAAATAATGAAAATTACG  
TTCTTACAAGCTTAAAGCTGATTGATCTTGTAAATGCAAAATGACTTAAATGAGTTACTTACA  
ATGCCATAAAATTGCAAGTTCTGATGATGTATAATCATGCTCATGTATAATTAGTACGTATAATGCTT  
TCTGAGTGAGTTTACTCTAAATCATTTGTTAAATCATTTGGCTGTTACTCCCTCTGTAGTT  
TTAATTAAAATTTAAAGATAAGTCTACATTAACAAATGATCACATCTAACAGCTTATCTTGTGAA  
TCTAAGTATATGAGAAAATCAGAATTGATAATTGCTTACTGATATTCAAGGTTAAAGTCAT  
TATTCTGGGCTTGGTAAGTGAATTATGAGATTACTGCTCTAGAAAGTATAGATGCCAAAGGACCGT  
TTGATTGCTTCTGATTACAGTCTGATTACCATGTGCTGCTAATATACTTTTTGTTAGATTG  
TCTTAATGGTAGGTCAAGTAATAAAAGAGATGAAATAATTAAATTCTAAATGAATCAGTTTCTC  
CCTTCTCCTTCCGCTTCCCTCTCTGCTCTCCCCGAAAGTCTACTCGGGTGGCAAAATGAAA  
GGGGAAAGTGAATTGGGATCGGTGTTTGAAAGAGCAATGTTATTTCAGTGCTTTCAGTTGTC  
AAAGAGTGGATCTAAAATCTGCTTAAAGGTAAATTGAGATGTAGCAGATTATTACTTAGTCATGGA  
AAGAAAAAAATTCAAGTCAAAAGCTAAAGATTCCCTTTGATTGAGACAGATTGGTCTGTTGG  
ACTTCCCAGACTTAATGGGAAACATCATTCTAGATTAGCATACTCTTGGTTAAATTAAATATA  
CATTAAATGTTACTTAGGGATACTTTATATTGCTATATAAAGCCTCATATAAAGCCTTATTCT  
GATGCTCTTAGTTCTGAGGAGTGAGATGATTAAGTGTATTCTTAAATTGTTAGATTG  
CCAGTGAAATTGGAGATATTGTGATGTTAGAAGAGCATTCTTAAATTGTTGCTTGAACATGTGTA  
CCTTTCTAGATTCTGAAATCCCTCCCCCGTCTCTGGAGTATGAAACCTTAAAGTCACAATAAAT  
GTAACAAAGAAAAAAAAAAAAAA

Human PRKAR1A mRNA sequence - var7 (public gi: 21757396) (SEQ ID NO: 117)  
TAATTTCCTGTTTTAAAAAATTGATTATGCTAGTAGTTGGCTAACAGATCCTCACTCCAGTG  
GTTTGCTCTGTCAGTTAGGATACTCCCAGGGATAGAAGTACGTATAAGGAATGTCAGATATTCTCA  
TTGTGCTGACTGCTTCTGTTACAGTTGACTTTGCTGCTGTAATTCTGATCTGTTACCGTTA  
CCTACTTCCCACGTCACTCATGATTCTTTGAGGGAGAACTGAAATCCCTTAAGGGCTGACTTC  
AGCACCCGTCTGAGAGGTTAGTGGCTCATACTCCCTCCAGGAGCTGAGGTATCGACTCTCACTGT  
TGCCTACAGAGCACAGATCCTGAACTAAATGAAACATTACTTGAATAATGCTAATTCTGTACATATT  
TATTCCCTAGTCCCACCTCCCTGTTAAAACAAAATCTACTTAGAAAAAAATCCCTGTAATCAGTTG  
TCTAATGAATTAGCAAGTTAAATGCAAGATTGACATTGCTTATAGTTTATACAAGCATGTTG  
TTTTTCTCGCAGAGAACCATGGAGCTGAGTACCGCCAGCTGAGGAGGACGCAGCCTTCGAGAA  
TGTGAGCTCTACGTCAGAACATCAAGCGCTGCTCAAAGATTCTATTGTGAGTTGCTGACTG  
CTCGACCTGAGAGAACCATGGCATTCTCAGGGATACTTGGAGGTTGGAGAACGGAGGAGG  
GATTCAAGATCTGCAAGAACAGCAGGCACTCGTACAGACTCAAGGAGGATGAGATTCTCCCT  
AACCCAGTGGTTAAAGGTAGGGCGACGAGGTGCTATCAGCGCTGAGGTCTACACGGAGGAAGATGG  
CATCCTATGTTAGAAAGTTATACAAAAGATTACAAGAACATGGCGCTTGTAGCCAAAGCCATTGAAA  
GAATGTGCTTTTACATCTGATGATAATGAGAGAAGTGATATTGATGCCATGTTTGGTCTCC  
TTTATCGCAGGAGAGACTGTGATTGCAAGGTGATGAAGGGATAACTCTATGTGATTGATCAAGGAG  
AGACGGATGCTATGTTAACATGAATGGCAACCAGTGTGGGAAGGGAGGCTTGGAGAACTTGC  
TTGATTATGGAACACCGAGAGCAGGCCACTGTCAAAGCAAAGACAAATGTGAAATTGTTGGGG  
CATGACCGACAGCTATAGAAGAACCTCATGGGAAGCACACTGAGAAAGCGGAAGATGTATGAGGAATT  
GTAAGTCTCTATTAGAGTCTCTGACAAGTGGAAAGCTCTACGGTAGCTGATGCAATTGGAAACAGT  
GCAGTTGAAGATGGGAGAAAGATTGTTGTCAGGGAGAACCCAGGGGATGAGTTCTCATTATTAGAG  
GGGTCACTGCTGCTACAACGTCGGTCAGAAAATGAAGAGTTGAGTGGGAAGGAGATTGGGG  
CTGATTATTGGTAAATTGCACTACTGATGAAATCGTCTCGTGTGCTGACAGTGTGCTGG  
CTTGAAGTGGCTTAAAGCTGGACCGACTGATTGAACTGTTGCTGCTGCTGCTGCTGCTGG  
CGAAACATCCAGTACAACAGTTGCTACTGCAAACATGCTTATTTCCTACTTGTGAGG  
ACTGGCATCGCAGCTTCTGTTATATTAAAGTGTGTTTATTGCAACATTTCATGGAG  
CATTAACAAATGCTCATACAGTTAAATAATGAAAGAGTTCTATGG

Human PRKAR1A mRNA sequence - var8 (public gi: 1658305) (SEQ ID NO: 118)  
AGAGCGTCAAGGGAGGCCGGAGGGAGGTGGGAGACAGAGGAGCGGAGGGACGAGAGGGAAAGCGC  
GATAGCTGCGGGAGAGAGAGCGAAGAGCAGGAGGAGGAACAAAGCGACCCAAAGACACCC  
CAGAGAACCATGGAGTCTGGCAGTACCGCCGCCAGTGAGGAGGCACGCAGCCTCGAGAATGTGAGCTCT

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ACGTCAGAAGCATAACATTCAAGCGCTGCTAAAGATTCTATTGTGCAGTTGTGCACTGCTCGACCTGA  
GAGACCCATGGCATTCCTCAGGAAACTTGTGAGAGGTTGGAGAAGGAGGAGCAAAACAGATTCAA  
CTGCAGAAAGCAGGCACTCGTACAGACTCAAGGGAGGATGAGATTCTCCCTCCACCCAA

Human PRKAR1A protein sequence - var1 (public gi: 4506063) (SEQ ID NO: 264)  
MESGSTAASEEARSRLRECELYVQKHNIQALLKDSIVQLCTARPERPMAFLREYFERLEKEAKQIQNLQK  
AGTRTDSREDEISPPPPNPVKGRRRRAISAEVYTEEDAASYVRKVIPKDYKTMALAKATEKNVLFSH  
LDDNERSDIFDAMFSVSFIAGETVIQQGDEGDNFYVIDQGETDVYVNNEWATSVGEFFSFGEALIYGTP  
RAATVKAKTNVKLWGIIDRDSYRRILMGSTLRKRKMYEEFLSKVSIRESLDKWERLTVADELEPVQFEDQ  
KIVVQGEPEGDEFIILEGSAAVLQRSSNEEFVEVGRGLPSDYFGEIALLMNRPRAATVVARGPLKCVKL  
DRPRFERVLGPCSDILKRNIQQYNSFVSLV

Human PRKAR1A protein sequence - var2 (public gi: 1658306) (SEQ ID NO: 265)  
MESGSTAASEEARSRLRECELYVQKHNIQALLKDSIVQLCTARPERPMAFLREYFERLEKEAKQIQNLQK  
AGTRTDSREDEISPPPP

Human PRKAR1A pray sequence - var1 (SEQ ID NO: 119)  
GCCGCTGGNTACCCATAACGACGTACAGTATTACGCTCATATGGCCATGGCAGGCAGTGCAATTCCA  
CCCAAGCAGTGGCTATCACGAGAGTGGTAGCGGGGATGGGAGCAAAGCAGCATGAGGAGCTCGGTA  
CNCCGCCGCTCNCACCCGAGCCTCGCGCCGCCGCCCCAGNGAACATGGAGCTGGCAG  
TACCGTTCCAGTGAGGAGGACNCAGCCTTCAGAAATGTGAGCTCTMNGTCAGAAGCATNACATTCA  
TGGCTNCTCAAAGATTCTNTGTGCANTTGCGCTGCTGACCTNAGAGACCGGGTGGCATTCTCAN  
GGAATACTGGCGNACGNNGNNTAATGANGAGGCCNTNTNCAAANTCTNCANNTTTNNNTCTT  
TNACAAACTTTGGACNATNANNANCCNTNNANANAAAATNNCTCCCGGGGNATTCT  
NCCC

Human PRKAR1A pray sequence - var2 (SEQ ID NO: 120)  
GAGCCGCCATGGNANTACCCATAACGACGTACCAAGNATTACGCTCATATGGCCATGGAGGCCAGTGAAAT  
TCCACCCAAGCAGTGGTATCAACGAGAGTGGTAGCGGGGCTGGGAGCAAAGCAGCTGAGGAGCTCGGTA  
CGCCGCCGCTCGCACCCGAGCCTCGCGCCGCCGCCCCAGAGAACATGGAGCTGGCAG  
TACCGCCGCAAGTGGAGGAGCAGCAGCAGCTTCAGAAATGTGAGCTCTACGTCAGAAGCATAACATTCAA  
GCGCTGCTCAAAGATTCTATTGTGCAGTTGTGCACTGCTCGACCTGAGAGACCCATGGCATTCTCAGGG  
AATACTTGAGAGGTTGGAGAAGGAGGAGGCAAACAGATTCAAATCTGAGAAAGCAGGCACTCGTAC  
AGACTCAAGGGAGGATGAGATTCTCCTCCACCCAAACCCAGTGGTAAAGGTAGGAGGCCAGGAGT  
GCTATCAGCGCTGAGGTCTACCGAGGAAAGATCGGCATCTTATGTTAGAAAGGTATACCAAAGATT  
ACAAGACGATGGCGCTTAGCCAAAGCCATTGAAAAGATGTGCTGTTTCACATCTTGATGATAATGA  
GAGAAGTGTATTTGATGCCATGTTCTGGCTCCTTATCGCAGGAGAGACTGTGATTCAANCAAGGT  
GATGAAGGGATAACTTCTATGTGATTGATCAAGGANAGACNGATGCTATGTTAACATGAATGGCNA  
CCANTGTTGGGAAGGAGGAGCTTGAAAAGTGCTTGTATTNANGGAANCCNNNGCNCCNTNGTC  
AAACAAAACAAA

Human PRKAR1A pray sequence - var3 (SEQ ID NO: 121)  
CGACGCGCTGGTATACCCATAACGACGTACCAAGTATTACGCTCATATGGCCATGGCAGGCCAGTGAAATT  
CCACCCAAGCAGGTGCGATATGCATACCGAGNAGTGAGTAACGGCGCTGGTAGCGAAGTCGCTGAGG  
GAGCTGGTACNCCGCCAGCGCTCGCACCCGCACCTCGCGCCGCCGCCCCAGAGAACCAT  
GGAGTCTGGCAGTACCGCCGCACTGAGGAGGAGCAGCAGCTTCAGAAATGTGAGCTCTACGTCAGAAG  
CATAACATTCAACGCTGCTCAAAGATTCTATTGTGCAGTTGTGCACTGCTCGACCTGAGAGACCCATGG  
CATTCCTCAGGAATACTTGAGAGGTTGGAGAAGGAGGAGGCAAACAGATTCAAATCTGAGAAAGC  
AGGCACTCGTACAGACTCAAGGGAGGATGAGATTCTCCTCCACCCAAACAGCTGGTTAAAGGTAGG  
AGGCGACGAGGTGCTATCGCGCTGAGGTCTACACGGAGGAAGATCGGCATCTATGTTAGAAAGGTAG  
TTTTGATATTGAAATATCGGGGGGAGCTTGGACCCACTGGTGGTCACTTANTCTCTGGATG  
ANTGATTCTTAAATCCAAAACNGGGNGGAACCTTCATCNCNTNTANANTNTGGNNCTGGAAAANNG  
TTTTNTAATACCNNTNNCAANGAAANANCNTTNGNGTTTNAANNNNGAAAANTGGCTTNGGG  
GTTNNNNNTTCCNTCNCNTNTTTNNNNAAAAGGNGGGCGGTTNG

Human PRKAR1A pray sequence - var4 (SEQ ID NO: 122)  
CGTANNNCGCGNGACTCGGTGACTGANGCCATGATCGCACATTACACACTATNTACCGTCTGACATCAT  
GGNTCAGTGTGCAAGGGCCATGTTGANNTCTCCNCNCATANATACAAGGNCTCAAGNNNGACANAACAAT  
AGAGANATATTCTTANTACTNACTCACTATAGGGCGAGCGCCCATGGAGTACCCATACGACGTNCCAG  
ATTACGCTCATATGGCCATGGAGGCCAGTGAAATTCCACCCAAAGCAGTGTTATCAACGAGTGAGCGG  
GGCTGGAGCAAAGCGCTGAGGGAGCTGGTACGCCGCCCTCGCACCCGAGCCTCGCGCCGCC

GCCCGTCCCCAGAGAACCATGGAGTCTGGCNGTACGCCNNANTGNGAGGCACGCAGCCTNNAGAAT  
GTGAGCTCTACGTCCAGAACATAACATNNNGCGCTGCTAAAGATTCTATTGTGCAGTTGTCACTGC  
TCGACCTGAGAGACCCATGGCATTCTCAGGGAATTACTTGTAGAGGTTGGANNAGGAGGAGGCNAACCA  
NATTCAAATCTGCNGAAAGCANNANTCNTACAGACTCAGGGNGGNANATTNTTATTCTCCCCCA  
NCCNANTGGTTAAGGGTNGGAGGCNACAGGNCTNTNNCCCTGAAGGNNTNCGGNGGAAGATNCGG  
ATTCCATGTTAAAANGGTNTTCCNNTANNNATTNCNANNAANANGGCCCTTTNNCCAAANCCT  
TCNAAAAAANGNCNNTTCCNANTNTNNNGGAANTNNAAAAGNGNTTTTAAANCCTNTT  
TNNGTTNTCTTTCNNGNGAAACNTNATTAAANNCCG

Unigene Name: PRKARIA Unigene ID: Hs.183037 Clone ID: 3GD\_188

Human PRKARIA mRNA sequence - var1 (public gi: 23273779) (SEQ ID NO: 396)  
GGTGGAGCTGCGCTAGCCGCTATCGCAGAGTGGAGCGGGCTGGGAGCAAGCGCTGAGGGAGCTCGG  
TACGCCGCCCTCGCACCCGCAGCCTCGGCCGCCGCCGCCCCAGAGAACCATGGAGTCTGGC  
AGTACCGCCGCCAGTGAGGAGGCACGCAGCCTTCAGAATGTGAGCTCTACGTCCAGAACATAACATT  
AAGCGCTGCTAAAGATTCTATTGTGAGTTGTGACTGCTGACCTGAGAGAACCATGGCATTCTCAG  
GGAATACTTTGAGAGGTTGGAGAAGGAGGAGGCAAAACAGATTCAAATCTGAGAAAGCAGGCACTCGT  
ACAGACTCAAGGGAGGATGAGATTCTCCTCTCCACCCAACCCAGTGGTAAGGTAGGAGGCACGAG  
GTGCTATCAGCGCTGAGGTCTACACGGAGGAAGATGCGGATCCTATGTTAGAAAGGTTACCAAAAGA  
TTACAAGACAATGGCCGTTAGCCAAGCATTGAAAAGAATGTGCTGTTTACATCTGATGATAAT  
GAGAGAAGTGTATTTGATGCCATGTTCTGGTCTCCTTATCGCAGGAGAGACTGTGATTCAAG  
GTGATGAAGGGATAACTTCTATGTGATTGATCAAGGAGAGACGGATGTCTATGTTAACATGAATGGC  
AACAGTGTGGGAAGGAGGGAGCTTGGAGAACCTGCTTGTGATTGAAACACCGAGAGCAGCCACT  
GTCAAAGCAAAGACAAATGTGAAATTGTGGGGCATCGACCGAGACAGCTATAGAAGAACCTCATGGAA  
GCACACTGAGAAAGCGGAAGATGTATGAGGAATTCTTAGTAAAGTCTCTATTTAGAGTCTCTGGACAA  
GTGGGAACGTCTACGGTAGCTGATGCATTGAAACCAGTGCAGTTGAAGATGGCAGAAGATTGTGGT  
CAGGGAGAACAGGGGATGAGTTCTCATTATTTAGAGGGTCAGCTGCTGCTACACGTCGGTCAG  
AAAATGAAGAGTTGTTGAAGTGGGAAGATTGGGGCCTCTGATTATTTGGTGAATTGCACTACTGAT  
GAATCGTCCTCGTGTGCCACAGTTGCTGCTGGCCCTTGAGTGCCTAAGCTGGACCGACCTAGA  
TTGAAACGTGTTCTGGCCCATGCTCAGACATCCTCAAACGAAACATCCAGCAGTACAACAGTTGT  
CACTGTCGTCGAAATCTGCCTCTGTGCCCTCTTCTCCTCTCCCCAATCCATGCTTCACTCATGC  
AAACTGCTTATTTCCCTACTTGCGCGCCAAGTGGCCACTGGCATCGCAGCTTCTGTCTGTTATAT  
ATTGAAAGTGTGTTTATTGACCAATTTCATTTGAGCATTAAACTAAATGTCATACACAGTTAAATA  
AATAGAAAGAGTTCTATGGAGACTTGCTGTTACTGCTTCTTTGTGAGTTAGTATTCAACCTGGG  
CAGTGAGTGCATGCTTTGGTGAAGGGCAGATCCCAGCACCTATTGAAATTACCATAGAGTAATGATGTA  
ACAGTGCAAGATTTTTTAAGTGACATAATTGTCAGTTAAGCGTATTTAGACTGTGGCCATATA  
TGCTGTATTCTTGTAGAATAAATGGTTCTCATTAACACTCTAAAGATTAGGGAAATGGATATAGAAA  
ATCTTAGTATAGAAGAACATCGCCTGTAATTAAACTAGTTAAGGGTGGAAAAATGCCATTGG  
CTAATTATCAATGGGATATGATTGGTCAGTTTTTTCCAGAGTTGTGTTGCAAGCTAATCTG  
CCTGGTTTATTTATATCTGTTATTAAATGTTCTTCTCCAATTCTGAAATACTTTGAGTATGGCTATC  
TATACCTGCCTTTAAGTTGAAACTAACTCATAGATTGCAAATATTGGTTAGTATTAACTACATCTG  
CTCGGCTCACAAATTCCGATTAGACCTTATCCAGCTAGTGCCTAAATAATTGATCAGATGCTGAATTGAG  
AATAAGAATTGAGGTCTACATTCTGGTTTAATTAGAGCGTTGGTAAAGTATGCTTCTCAGCTG  
ACTCCAGTATAATCTCTGCTCATTAACACTGATTCCAGGAGATTGGATTGCTGTGACTAGATACAGA  
TGGAGCAAATGCTAACAGAGAAATAGAGGTGATGCTGCTAAAGGGAGAAATGCCAGGCGGACAAAGTT  
CAGTGCAGGGAAATTCTCCCGTGCACATTCACTGGGCATGAGATTGGAAGAAGTTTTACTTTGGTT  
TAGTCTTTCTCCCTTTTATTGAGCTAGAATTCTGGTGGTTGATGGTAGGGTATAATGTGTCT  
GTGTTGCTCAAATTGGTCTGAAGAGCTATCCTGCGGAAAGTCCTGCTTCTATCTGATTATTCT  
CTGGCAAACCTTTCTTTCTTTAAAGTAAACTGTTGAGTTTCTGATGTTACTGCTTAACGTATTCA  
TTTCCAGCCTATGTGTTACATTATTCCAATGATACCAACAGTTATTGTTATTATTAAACAAA  
ATTTCACAGTTCTGTAATGTAGGCACCTTATTGTTATTGATTTATATAAGGTAATGTAGGGTTAT  
ATTGGGAGTGACTGCAAGCATTTCATCTGCTGCAACTAACTGACTCTGTTATTGATCCCTCTCC  
TGCCCTTCCAGGTAATTAAATTGGTCTGAGATTCTGATGTTACTGAAAGAAACTTTAGGGT  
TTACCAAGTATGAAGTATAAAATCTGGGAAGAGGTTTATTACATTAGGGTTCTGATCTGACTTTGTGTT  
TTGTTACAAATTAAATTCCAAAATAATCTATATAATGAGGGTTCTGATCTGACTTTGTGATTGAT  
AGCTACCTTTATATTAAAAAATTAAATGAAAATTACGTTCTACAGCTTAAAGCTTAAAGCTGATTGAT  
CTTGTGTTAAATGCCAAATGTACTTAAATGAGTTACTTGAATGCCATAAAATTGCAAGTTCTGATGTATG

PCT/US04/06308

TATATAATCATGCTCATGTATTTAGTTACGTATAATGCTTCTGAGTGAGTTTACTCTTAAATCATT  
TGGTTAACATCTTGGCTGCTGTTACTCCCTCTGTAGTTAATTAAAAACTTAAAGATAAGTCT  
ACATTAACAAATGATCACATCTAAAGCTTATCTTGTATCTAAGTATATGTGAGAAATCAGAATTG  
GCATAATTGTCTTAGTTGATATTCAAGGCTTAAAGTCATTATCCTGGCTTGGTAAGTGAATTAT  
GAGATTACTGCTCTAGAAAGTATAGATGGCAAAGGACCGTTGTATTGCTTCTGATTACCAGTCTG  
ATTATACCATGTGTCTAATATACTTTTTGTTAGATTGTCTTAATGGTAGGTCAAGTAATAAAAAG  
AGATGAAATAATTAAAAAAAAAAAAAA

Human PRKARIA mRNA sequence - (public gi: 4506062) (SEQ ID NO: 397)  
GCTGGGAGCAAAGCGCTGAGGGAGCTCGGTACGCCGCCCTCGCACCCGAGCCTCGGCCGCCCG  
CCCCTCCCAGAGAACCATGGAGCTGGCAGTACCGCCAGTGAGGAGGCACGCAGCCTCGAGAATG  
TGAGCTCTACGTCAGAACATAACATTCAAGCGCTCAAAGATTCTATTGTGAGTTGTGACTGCT  
CGACCTGAGAGACCCATGGCATTCTCAGGGAAACTTGTAGAGGTTGGAGAAGGAGGAGGCAAACAGA  
TTCAGAATCTGAGAAAGCAGGCACTGTACAGACTCAAGGGAGGATGAGATTCTCCTCCACCCAA  
CCCAGTGGTTAAAGGTAGGAGGCGACGGTGTATCAGCCTGAGGTCTACACGGAGGAAGATGCGGCA  
TCCTATGTTAGAAAGGTATACAAAAGATTACAAGACAATGGCCGTTAGCAAAGCCATTGAAAAGA  
ATGTGCTGTTTACATCTGTGATAATGAGAGAAGTGTATTTTGATGCCATGTTTCGGTCCTT  
TATCGCAGGAGAGACTGTGATTCAAGGTGATGAAGGGATAACTTCTATGTGATTGATCAAGGAGAG  
ACGGATGTCTATGTTAACATGAATGGCAACCAGTGTGGGAAGGGAGCTTGAGAAGTGTGCTT  
TGATTATGGAACACCGAGAGCAGCCACTGTCAAAGCAAAGACAATGTGAAATTGTGGGCATCGACCG  
AGACAGCTATAGAAGAACATCTCATGGAAAGCAGCAGTGAAGAACAGGAGAAGATGTGAGGAAATTCTTAGT  
AAAGTCTCTATTTAGAGTCTCTGACAAGTGGGAACCTTACGGTAGCTGATGCATTGAAACCAGTGC  
AGTTGAAGATGGCAGAAGATTGTGGTGAGGGAGAACAGGGATGAGTTCTCATTATTTAGAGGG  
GTCAGCTGCTGTGCTAACACGTGTCAGAAAATGAAGAGTTGTGAAGTGGGAAGATTGGGCCTTCT  
GATTATTTGGTGAATTGCACTACTGATGAATGTCCTCGTGTGCCACAGTTGTTGCTCGTGGCCCT  
TGAAGTGCCTAAGCTGGACCGACCTAGATTGAAACGTGTGGGCCATGCTCAGACATCCTCAAACG  
AAACATCCAGCAGTACAACAGTTGTGACTGTCTGTGAAATCTGCCCTGTGCTCCCTTTCT  
CCTCTCCCCATCCATGCTTCACTCATGCAAACGTGTTATTTCCCTACTGCAAGGCCAAGTGGCAC  
TGGCATGCGAGCTCTGCTGTTATATATTGAAAGTTGCTTTATTGCAACATTTCATTGGAGCA  
TTAACTAAATGCTCATACACAGTTAAATAAGAAAGAGTTCTATGGAGACTTGCTGTTACTGCTTCT  
CTTGTGCTAGTGTAGTATTCCACCTGGCAGTGAGTGCCTGCTTGTGAGGGCAGATCCAGCACC  
TATTGAATTACCATAGAGTAATGTAAACAGTGCAGAATTTTTTAAGTGACATAATTGTCCAGT  
TATAAGCGATTTAGACTGTGCCATATATGCTGTATTCTTGTAGAATAATGGTTCTCATTAACACT  
CTAAAGATTAGGAAATGGATATAGAAAATCTTAGTATAGTAGAAAGACATCTGCCCTGTAATTAAACTAG  
TTAAGGGTGGAAAATGAAAATTGGTCAATTATCAATGGGATATGATTGGTTCAAGTGTGACATAATTGTCCAGT  
AGAGTTGTTGCTTGCAGCTAATCTGCCCTGTTATTATATCTTGTATTAAATGTTCTTCTCCAATT  
CTGAAATACTTTGAGTATGGCTATCTACCTGCCCTTTAAGTTGAAACTAACTCATAGATGCAAATA  
TTGGTTAGTATTAACTACATCTGCCCTGGCTCACAAATTCCGATTAGACCTTATCCAGCTAGTGC  
ATAATTGATCAGATGCTGAATTGAGAATAAGAATTGAGGTCTACATTCTGGTTGTTAATTAGAGCGT  
TTGGTTAAAGTATGTCTTCAGCTGACTCCAGTATAATCTCCTCTGCTCATTAACACTGATTCAGGAGAT  
TGGATTGCTGTGACTAGATACAGATGGAGCAAATGCTTACAGAGAAATAGAGGTGATGCTGCTAAAG  
GGAGAAATGCCAGGGACAAAGTCAGTGTGGGAATTTCCTCGTGCACATTCACTGGGCATGAGATT  
TTGGAAGAAGTTTTACTTTGGTTAGTCCTTTCTCTCTTTTATTCAAGCTAGAATTCTGGTGGG  
TTGATGGTAGGGTATAATGTGTCTGTGCTTCAAAATTGGCTGAAAGCTATCTGCTGAAAGTCCTG  
CTTCCCTATCTAGCATTTATTCTCTGCCAACTTTCTTTCTTTAAAGTAAACTTGTGTAT  
TGAGTCTTAACTGTATTTCAGTATTCTCAGCCTTATGTGTTACATTATCCAATGATACCCAAACAGTT  
ATTTTTATTATTTAAACAAAATTTCACAGTTCTGTAATGTAGGCACCTTATTTCATTGTGATT  
ATATATAAGGTAAATGTAGGGTATATTGGGAGTGACTGCAAGCATTCTCATCTGTC  
GACTCTGTTATTGATCCCTCTGCCCTTCCAGGTAAATTAAAGTGTGATGGTAGATTTTCTCA  
TAGATTGAAAACCTTTAGGTTGTTACCAAGTATGAAGTATAAATCTGGGAAGAGGTTTATTACAT  
TTAGGGTGGTAAAGAAAGCCACCTGTTACAATTTTAAATTCCAAAATAATCTATATTAAATGAGG  
GTTCTGATCTGACTTTGTGTTAGCTACCTTTATATTAAAAATTAAAGAAAATTATGTTCT  
TACAAGCTTAAAGCTGATTGATCT

Unigene Name: PTPN12 Unigene ID: Hs.62

Human PTPN12 mRNA sequence - var1 (public gi: 292408) (SEQ ID NO: 123)  
AGCAGCCGAGCGGGGGACGGGGAGGATGGAGCACTGGAGATCTGAGGAAATTCTCCAGAGGGT  
CCAGGCCATGAAGACTCCTGACCACAATGGGGAGGACAACCTCGCCCGGACTTCATGCAGTTAAGAAGA  
TTGTCTACCAAAATATAGAACAGAAAAGATATATCCCACAGCCACTGGAGAAAAGAAGAAAATGTTAAAA  
AGAACAGATAACAGGACATACTGCCATTGATCACAGCCAGTTAAATTGACATTAAAGACTCCCTCACAA  
AGATTCAAGACTATATCAATGCAAATTATAAAGGGCGTCTATGGGCCAAAGCATACTGAGCAACTCAAA  
GGACCTTAGGAAATACAGTAATAGATTTGGAGGATGATATGGAGTATAATGTTGATCATTTGAA  
TGGCCTGCCAGAATTGAGATGGAGAAAATGTGAGCGTATTGGCCTTGATGGAGAAGGACCC  
CATAACGTTGCACCAATTAAATTCTGTGAGGATGAAACAAGCAAGAACAGACTACTTCATCAGGACA  
CTCTTACTTGAATTCAAATGAATCTCGTAGGCTGATCAGTTCAATTGTAAGCTGGCCAGACCAG  
ATGTTCCCTCATCATTGATTCTATTCTGGACATGATAAGCTTAATGAGGAATATTCAAGAACATGAAGA  
TGTTCCTATTGATTCTATTGAGCTGCAGGCTGTGGAAGAACAGGTGCCATTGTCAGATTATACG  
TGGAAATTACTAAAGCTGGGAAAATACCAAGAGGAATTAAATGTTAAATTAAATACAAGAACATGAGAA  
CACAAAGGCATTCTCGAGTACAAACAAAGGAGCAATATGAACTTGTCACTAGAGCTATTGCCAACTGTT  
TGAAAAAACAGCTACAACATATGAAATTCTATGGAGCTCAGAAAATTGCTGATGGAGTGAATGAAATTAAAC  
ACTGAAAACATGATCAGCTCCATAGCCTGAAAACAGATTCTCCTCCAAAACCACCAAGGACCC  
GCAGTTGCCATTGTAAGGGAGTGTAAAGAACAGAAATTACTGCAGCCACCGAACCTCATCCAGTGCCACC  
CATCTGACACCTCTCCCCCTCAGCTTTCAACAGTCACTACTGTGTCAGGACAATGATAGATAC  
CATCCAAGCCAGTGTGCAATGGTTCATCAGAACACATTCAAGCACACTCAACAGAAACTATAGTA  
AAATCAACAGAACCTCCAGGGAAAATGAATCAACAAATTGAAACAGATAGATAAAAATTGAAAGAAAATT  
AAGTTTGAGATTAAGAACAGTCCCTCTCAAGAGGGACCAAAAGTTTGATGGGAACACACTTTGAAAT  
AGGGGACATGCAATTAAATTAACTGCTTCACCTTGATAGCTGATAAAATCTCTAACGCCACAGGAAT  
TAAGTTAGATCTAAATGTCGGTGAATTCTCCAGAATTCTGTGTCAGTGAACACAATCAA  
CAAAGTTCTAGTTACTCCACCAAGAAGAACATCCAGAATTCAAGACACCTCCAAAGGCCAGACGCTTGCT  
CTTGATGAGAACAGACATGTAACGTGGTCAATTGACCTGAAATGCCATACCTGATTAT  
CTGAAGGCAATTCTCAGATATCAACTATCAAACATTAGGAAAATTGAGTTAACACCAAGTCCCTAACAC  
ACAAGTTGAAACACTGATCTTGTGGATCATGATAACACTTCAACACTCTTCAAGAACACCCCTCAGTTT  
ACTAAATCTCCTACTCTGATGACTCAGACTCAGATGAAAAGAAACTCTGATGTCGCTGTGACCCAGAATA  
AAACAAATATTCAACAGCAAGTGCACAGTTCTGCTGCCACTAGTACTGAAAGCATTCTACTAGGAA  
AGTATTGCAATGTCATTGCTAGACATAATAGCAGGAAACACACATTCAAGGTGCTGAAAAGATGTT  
GATGTTAGTGAAGATTCACTCTCCCCTACCTGAAAGAACCTCTGAAATGTTGTGTTAGCAAGTGAAC  
ATAATAACACCTGTAAGATCGGAATGGAGTGAACCTCAAAGTCAGGAACGATCTGAACAAAAAAAGTCTGA  
AGGCTTGATAACCTCTGAAAATGAGAAATGTGATCATCCAGCGGGAGGTATTCACTATGAAATGTGATA  
GAATGTCACCTACTTCAGTGCACAAGAGAGAACAAATCATGAAAATCCAACAGCACAGATATTG  
GTTTGTGAAATCGATGTTGAAAACCCAAAGGACCAAGAGATCCACCTTCAGAATGGACATGATTCAAGGG  
GCTAGAACAGACTTAAAGTTACTGGAAAATTCTAGGTGCCACTGAAAGGCCAGATTATAGTTACCTC  
TTAATATGTTGAGCTAACAGCAGTGTGAGATTGTTACCTTAATTTTGTGTCGGGACCATCTACCTG  
TTACTACACTTAGGAAAAGTATTACATATGGTTATTGAAACTTCAGTATTATGCTTAATGTT  
CTCTTAACCTGTTACACGCTGCTGTGAGACATGTTAATATAGTAACTACCTTATGATATATTGAGTTA  
AGGACTACTCTTTCTGTTTATCATGTCGATTATTTGTATATGTCAGGGCAAGTAGGTATATAA  
TTTGATAAAAGTGTGAAATTGAAATTATTAAACAGAACAGATGTAAGAAAATTCTGTCAGGTTCAAAATCTTG  
TGTACTTTATTGTAATTATTGTCGAGTTTGTGAGTTTGTGAGTTTGTGAAATTAAACTTGCTGGAT  
TCATGCAGCCAGCTTGCAGGTTATCAGAGATCAAAGATTGTAATAATAATTGTAATTGTAAGCAAA  
AAGTTATTGTTATATTATACAGTCAATTGTCATCTTAATTGTCGTTCTGTTGTTCTTAATATTGAAACTCAAG  
TCAGTAAGTGCCTTGGAAACAATATTGAAATTCTCTTACGTTGTTGTTCTTAATATTGAAACTCAAG  
TGGGATTAGAACAGACTATCAAACATGATGTTCAGATATTGACCTGTCATTAAAAAAACAAACAG  
TTTACAGTG

Human PTPN12 mRNA sequence - var2 (public gi: 29476876) (SEQ ID NO: 124)  
GGGGAGAGGCCGCTGGCTGGCTCGGCTGCTGGCGGGGGTGGGGGGGAGGAGGAACCGGGAAAGGG  
GGGGCAGGGCGAGCGAGAGCTAGCTGTCTCTGAGGCGCACCCGCCCTAGGGCGGTGGGGAGGAGG  
AGGGAGCCGCGGGCTTGGCGGGGAGGGAGGGACGTGCTGGGAACGAGCTGGGAAGACGGAG  
CGGGCTCTGTGCCGGCGGGCGGGCGGGCGGGGGCCAGCGACCCAGCGGGGGACGGGAGGATGG  
AGCAAGTGGAGATCTGAGGAATTCATCCAGAGGTTCCAGGCCATGAAGAGTCCTGACCACAATGGGA  
GGACAACCTCGCCCCGGACTTCATGCGGTTAAGAAGATTGTCTACCAAATATAAACAGAAAAGATAT  
CCCACAGCCACTGGAGAAAAGAAGAAAATGTTAAAAGAACAGATACTGCCCATTGATC  
ACAGCCGAGTTAAAATGACATTAAAGACTCTTCACAGAGATTCAAGACTATATAATGCAATTATAAA  
GGGCGTCTATGGGCCAAAAGCATATGTAGCAACTCAAGGCCTTAGCAAAATACAGTAATAGATTG  
AGGATGATATGGAGTATAATGTTGATCATTGTAATGGCCCTGGAGAATTGAGATGGGAAGGAAAA  
AATGTAAGCGTATTGGCCTTGTATGGAGAAGACCCATAACGTTGCACATTAAATTCTGTGA  
GGATGAACAAGCAAGAACAGACTACTTCATCAGGACACTCTTACTTGAATTCAAAATGAATCTCGTAGG  
CTGTATCAGTTCAATTATGTGAACTGGCAGACCATGATGTTCTTCATCATTTGATTCATTCTGGAC

TGATAAGCTTAATGAGGAATATCAAGAACATGAAGATGTTCTATTGTATTCAATTGCAGTGAGGCTG  
 TGGAAGAACAGGTGCCATTGTGCCATAGATTATACTGGAAATTACTAAAGCTGGAAAATACACAGAG  
 GAATTAAATGTATTTAATTAAATACAAGAAATGAGAACACAAGGCATTCTGCAGTACAACAAAGGAGC  
 AATATGAACCTGTCAGAGCTATTGCCAAGTGTGAAAAACAGCTACAACATGATCAGCTCCATAGAGCCTGAA  
 AGCTCAGAAAATTGCTGATGGAGTGAATGAAATTAAACACTGAAAACATGATCAGCTCCATAGAGCCTGAA  
 AAACAAGATTCTCCTCCAAAACCACCAAGGACCCGAGTGCCTTGTGAAGGGAGTCTAAAGAAG  
 AAATACTGCAGCACCGAACCTCATCAGTGCACCCATCTGCACACCTCTCCCCCTCAGCTTTCC  
 AACAGTCACTACTGTGTGGCAGGACAATGATAGATACCTCAAAGGAGTGTGCATATGGTTCATCA  
 AAACAACATTCAAGCAGACCTCAACAGAAACTATAGTAAATCAACAGAACCTCCAGGGAAAATGAATCAA  
 CAATTGAACAGATAGATAAAAATTGGAACGAAATTAAAGTTGAGATTAAGAAGGTCCCTCTCCAAGA  
 GGGACCAAAAGTTGATGGAACACACTTTGAATAGGGACATGCAATTAAATTAATCTGCTTC  
 CCTTGATAGCTGATAAAATCTCAAGGCACAGGAATTAAAGTCAGATCTAAATGTCGGTGATACTTCCC  
 AGAATTCTGTGTGGACTGCAGTGTAAACACAATCAAACAAAGTTCAAGTACTCCACAGAAGAACCC  
 GAATTCAAGACACACCTCCAAGGCCAGACCGCTTGCCTCTTGATGAGAAAGGACATGTAACGTGGTCATT  
 CATGGACCTGAAAATGCCATACCCATACCTGATTATCTGAAGGCATTCTCAGATATCAACTATCAA  
 CTAGGAAAATCTGAGTTAACACCAAGTCTACAACACAAGTTGAAACACCTGATCTGTGGATCATGA  
 TAACACTTCACCACTCTCAGAACACCCCTCAGTTTACTAATCCACTTCACTCTGATGACTCAGACTCA  
 GATGAAAGAAACTCTGATGGTGTGACCCAGAAATAAAACTAATATTCAACAGCAAGTGCACAGTT  
 CTGCTGCCACTAGTACTGAAAGCATTCTACTAGGAAAGTATTGCCAATGTCATTGCTAGACATAAT  
 AGCAGGAACAAACACATTCAAGGTGCTGAAAAGATGTTGATGTTAGTGAAGGATTACCTCCCTCCCTACCT  
 GAAAGAACTCCTGAATCCTGTTGTTAGCAAGTGAACATAATACACCTGTAAGATGGAATGGAGTGAAC  
 TTCAAAAGTCAGGAACGATCTGAACAAAAGTCTGAAAGGCTGATAACCTCTGAAAATGAGAAATGTGA  
 TCATCCCAGCGGAGGTTACTATGAAATGTGCAAGAATGTCACCTACTTCTGAGCAGAGAGAA  
 CAAATATCAGAAAATCCAACAGAACAGATAATTGGTTGGTAATCGATGTGGAAAACCAAAGGAC  
 CAAGAGATCCACCTCAGAATGGACATGATTCAAGGAGCTAGAACAGACTTTAAGTTACTGGAAAATT  
 CAGGTGCCACTGAAAGCCAGATTATAGTATTCCATCTTAATATGTGGGACTAACAGCAGTGTAGATTG  
 TTACCTTAATATTTTGCTGGGACCATCTACCTGCCTTAACTACACTTAGGAAAAGTATTACATATG  
 GTTATTTGAAACTTCAGTATTATTGCCCTTAATGTCTCTTAACCTGTTACCGCTGCTTGTAGACAT  
 GTTAATATAGTAAACCTTATGATATTGAGTTAAGGACTACTCTTTCTGTTTATCATGTATGC  
 ATTATTTGTTGATATGTAACAGGGCAAGTAGGTATATAATTGATAAAAGTTCGAATTGAAATATTAA  
 GAAGATGTAAGAAATTCTGCTCAAATCTTGTGTACTTATTGTAAGGTTATTTGCCCCCTGGAGT  
 TTGAGAAAATAGTTCTGAATTAACTTGTAAATTGTAAGCAAAAGTTATTGTTATATTACAGTCTAATTG  
 TCATCCTAATTGTCCTGTTCTAGTCAAGGACTAACAGTCAAGTGGGATTAGAAGACTATCAAATACATGTATG  
 TTAGCTGTGTGTTCTTAATATTGAACTCAAGTGGGATTAGAAGACTATCAAATACATGTATG  
 TTCAGGATATTGACCTGTCATTAACAAACAGTTACAGTGCACCAAAAAAAAAAA

Human PTPN12 mRNA sequence - var3 (public gi: 18375651) (SEQ ID NO: 125)  
 AGCGACCGCAGCGGGGGACGGGGAGGATGGAGCAAGTGGAGATCCTGAGGAAATCATCCAGAGGGT  
 CCAGGCCATGAAGAGTCCTGACCACAATGGGGAGGACAACCTCGCCCGGACTTCATGCGGTTAAGAAGA  
 TTGCTACCAATATAGAACAGAAAAGATATATCCCACAGCCACTGGAGAAAAGAACAAAATGTTAAA  
 AGAACAGATAACAGGACATACTGCCATTGATCACAGCCGAGTTAAATTGACATTAAGACTCCTTCACA  
 AGATTCAAGACTATATCAATGCAAATTATAAAGGGCGTCTATGGCCAAAAGCATATGTAGCAACTCAA  
 GGACCTTCTGAAATACAGTAATAGATTGGAGGATGATGGGAGTATAATGTTGATCATGTA  
 TGGCCTGCCAGAATTGAGATGGGAGGAAAATGTCAGGCTATTGCCCTTGATGGAGAACAGCC  
 CATAACGTTGACCATTTAAATTCTCTGAGGATGAAACAAGCAAGAACAGACTACTTCATCAGGACA  
 CTCTTACTCTGAATTCTCAAATGAATCTCGTAGGCTGTATCAGTTCTATTGTAACCTGGCCAGACCATG  
 ATGTTCTCATTTGATCTATTGAGCATGATAAGCTTAATGAGGAATATTCAAGAACATGAAGA  
 TGTTCTATTGTTGATCTCATGTCAGGCTGAGGCTGAGAACACAGGTGCCATTGTCATAGATTATACG  
 TGGAAATTACTAAAGCTGGGAAAATCACAGAGGAATTAAATGTTGATTTAATTAAACAGAACATGAGAA  
 CACAAAGCATTCTGCAGTACAACAAAGGAGCAATATGAAACTGTTCATAGAGCTATTGCCCAACTGTT  
 TGAAAACAGCTACAACATGAAATTCTGAGGCTCAGAAAATTGCTGATGGAGTGAATGAAATTAAAC  
 ACTGAAAACATGATCAGCTCCATAGAGCCTGAAAAACAGATTCTCCTCTCCAAAACCACCAAGGACCC  
 GCAGTTGCCCTGTTGAAGGGGATGCTAAAGAACAAACTGCAAGCCACCGGACCTCATCCAGTGCACC  
 CATCTTGACACCTCTCCCCCTTCAGCTTCAACAGTCACACTGTGTGGCAGGACAATGATAGATAC  
 CATCCAAAGCCAGTGTGCATATGGTTCATCAGAACAAACATTCAAGCAGACCTCAACAGAAACTATAGTA  
 AATCAACAGAACATTCCAGGGAAAATGAATCAACAATTGAACAGATAGATAAAAATTGGAACGAAATT  
 AAGTTTGAGATTAAGAACAGTCCCTCTCAAGAGGGACCAAAAGTTGATGGGAAACACACTTTGAAT  
 AGGGGACATGCAATTAAATTAAATCTGCTTCACCTGTTAGCTGATAAAATCTCTAAGCCACAGGAAT  
 TAAGTTCTGAGATCTAAATGTCGGTGATACTTCCCAGAATTCTGTTGAGACTGCAGTGTAAACACAATCAA  
 CAAAGTTCTGAGGACTCCACCAAGAACATCCCAGAATTCAAGAACACACCTCCAAGGCCAGACCGCTTGCCT  
 CTGATGAGAACAGGACATGTAACGTGGTCATTGATGGACCTGAAAATGCCATACCCATACCTGATTAT  
 CTGAAGGCAATTCTCAGATATCAAACTTAGGAAAACGTGTGAGTTAACACCAAGTCCTACAAC

Figure 36 part - 70

ACAAAGTTGAAACACCTGATCTGGATCATGATAACACTTCACCACTCTCAGAACACCCCTCAGTTT  
ACTAATCCACTTCACTCTGATGACTCAGACTCAGATGAAAGAAACTCTGATGGGCTGTGACCCAGAATA  
AAACTAATATTCAACAGCAAGTGCACAGTTCTGCTGCCACTAGTACTGAAAGCATTCTACTAGGAA  
AGTATTGCCAATGTCCATTGCTAGACATAATATAGCAGGAACACACATTCAAGTGCTGAAAAAGATGTT  
GATGTTAGTGAAGAGATTCACTCCTCCCCCTACCTGAAAGAAACTCCTGAATCGTTGTAGCAAGTGAAC  
ATAATACACCTGTAAGATCGGAATGGAGTGAACITCAAAGTCAGGAACGATCTGAACAAAAAAAGTCTGA  
AGGCTTGATAACCTCTGAAAATGAGAAATGAGATCATCCAGGGGGAGGTATTCACTATGAAATGTGCATA  
GAATGTCACCTACTTCAGTGACAAGAGAGAACAAATATCAGAAAATCCAACAGAACGCCACAGATAATTG  
GTTTGGTAATCGATGTGGAAAACCCAAAGGACCAAGAGATCCACCTTCAGAATGGACATGATTCAAGGGA  
GCTAGAAGACACTTAAAGTTAACTGAAAATTCAAGTGCCACTGAAAGGCCAGATTATAGTATTCCATC  
TTAATATGTGGACTAACAGCAGTGTAGATTGTACCTTAATATTTTGCTGGGACCATCTACCTGCC  
TTATRACTACACTTAGGAAAAGTATTACATATGGTTATTTGAAACTTCAGTATTATGCTTAATGT  
CTCTAACCCCTGTTACACGCTGTTAGACATGTTAATATAGTAATACCTTTATGATATATTGAGTTA  
AGGACTACTCTTTCTGTTATCATGTATGCATTATTTGATATGTACAGGGCAAGTAGGTATATAA  
TTTGATAAAAGTTGCAATTGAAATATTAAACAGAAGATGTAAGAAATTCTGCATGGCTAAATCTTGT  
TGTACTTTATTGTAATTATTGCCCCTGGAGTTAGAAAATAGTTCTGAAATTAAAATTGCTGGGAT  
TCATGCAGCCAGCTTGCAGGTTATCAGAGATCAAAGATTGTAATAATAATTGTAAGCAAA  
AAGTTATTTTATATATACAGTCAATTGTCATCTTAATTGTCCTGTTCTTCACTAGTCAGAGAT  
TCAGTAAGTGCCTGGAAACAAATTGAAATTCTCTAGCTGTGTGTTCTTAAATTGAACTCAAG  
TGGGATTAGAAGACTATCAAACATGTATGTTCAGGATATTGACCTGTCATTAAAAAAACAAACA  
GTTTACAGTG

Human PTPN12 mRNA sequence - var4 (public gi: 545651) (SEQ ID NO: 126)  
GTTAAAAGGAACAGATAACAGGACATACTGCCATTGATCACAGCCAGTTAAATTGACATTAAAGACTC  
CTTCACAAGATTCAAGACTATATCAATGCAAATTCTAAAGGGCGTCTATGGGCCAAAGCATAATGTAGC  
AACTCAAGGACCTTAGCAAAATACAGTAATAGATTGGAGGATGGTATGGAGTATAATGTTGATC  
ATTGTAATGGCCTGCCGAGAATTGTA

Human PTPN12 mRNA sequence - var5 (public gi: 19683965) (SEQ ID NO: 127)  
GGGACTTCACCCTCTCAGAACACCCCTCAGTTTACTAATCCACTTCACCTCTGATGACTCAGACTCAG  
ATGAAAGAAACTCTGATGGGCTGTGACCCAGAATAAAACTAATATTCAACAGCAAGTGCACAGTTTC  
TGCTGCCACTAGTACTGAAAGCATTCTACTAGGAAAGTATTGCAATGCTCATTGCTAGACATAATATA  
GCAGGAACACACATTCAAGGTGCTGGAAAAGATGTTGATGTTAGTGAAGATTCACTCCCTCCCCACCTG  
AAAGAACTCCTGAATGTTGTGTTAGCAAGTGAACATAATACACCTGTAAGATGGAATGGAGTGAAC  
TCAAAGTCAGGAACGATCTGAACAAAAAAAGTCTGAAGGCTTGATAACCTCTGAAAATGAGAAATGTGAT  
CATCCAGGGAGGTATTCACTATGAAATGTGCATAGAATGTCACCTACTTTCACTGACAAGAGAGAAC  
AAATATCAGAAAATCCAACAGAACAGATATTGTTGGTAATGATGTTGAAAACCCAAAGGACC  
AAGAGATCCACCTCAGAATGGACATGATTCAAGGAGCTAGAACACTTTAAGTTAACTGGAAAATTC  
AGGTGCCACTGAAAGCCAGATTAGTATTGTTATCCATCTTAAATATGTTGAAACTACAGCAGTGTAGATTG  
TACCTTAATATTGCTGGGACCATCTACCTGCTTAACTACACTTAGGAAAAGTATTACATATGG  
TTTATTGAAACTTCAGTATTATTGCTTAAATGCTCTTAACCTGTTACACGCTGTTGAGACATG  
TTAATATGTAATACCTTATGATATATTGAGTTAAGGACTACTTTCTGTTTATCATGTATGCA  
TTATTTGTTATATGACAGGGCAAGTAGGTATATAATTGATAAAAGTTGCAATTGAAATATTATAACAG  
AAGATGTAAGAAAATTCTGCATGGTCAAATCTTGTACTTTATTGAAATTATTGCCCCTGGAGTT  
TTAGAAAATAGTTCTGAAATTGAACTGCTGGATTGATCAGGCCAGCTTGCAGGTTATCAGAGATCA  
AAGATTGTAATAATAATTGTAAGCAAAAGTTATTGTTATATTATAACAGTCTAATTGTT  
CATCCTAATTGTCCTGTTTCACTAGTCAGAGATTCAAGTAGTGCCTGGAAACAAATTGAAATTCTCT  
TAGCTTGTGTGTTCTTAAATTGAAACTCAAGTAGGGATTAGAAGACTATCAAACATGTATGTT  
TCAGGATATTGACCTGTCATTAAAAAAACAAACAGTTTACAATAAAAAAAAAAAAAAA  
AAAAAA

Human PTPN12 mRNA sequence - var6 (public gi: 220033) (SEQ ID NO: 128)  
GCCGGGGGGACGGGGAGGATGGAGCAAGTGGAGATCCTGAGGAATTCACTCCAGAGGGTCCAGGCCATG  
AAGAGTCCTGACCAACATGGGAGGACAACCTTCGCCGGGACTTCATGCCGTTAAGAAGATTGCTACCA  
AAATATGAAACAGAAAAGATATATCCACAGCCACTGGAGAAAAGAAGAAAATGTTAAAAGAACAGATA  
CAAGGACATACTGCCATTGATCACAGCGAGTTAAATTGACATTAAAGACTCCTTCACAAGATTCAAG  
TATATCAATGCAATTGTTATAAAGGGCGTCTATGGCCAAAAGCATATGTCAGCAACTCAAGGACCTTGT  
CAAATACAGTAATAGATTGAGGATGGTATGGAGTATAATTGTTGATCATTGTAATGGCCTGCC  
AGAATTGAGATGGGAAGGAAAAAGTGTGAGCGTATTGGCTTGTATGGAGAAGACCCATAACGTT  
GCACCAATTAAAATTCTGTGAGGATGAAACAGCAAGAACAGACTACTTCATCAGGACACTCTTACTG  
AATTGAAATCTCGTAGGCTGATCAGTTCAATTGTAATTGACTGGCCAGACCATGATGTTCTTC  
ATCATTGATTCTATTGACATGATAAGCTTAATGAGGAAATATCAAGAACATGAAGATGTTCTTATT

TGTATTCAAGTGCAGGCTGTGGAAAGAACAGGTGCCATTGTGCCATAGATTATACGTGGAATTAC  
 TAAAAGCTGGAAAATACCAAGAGGAATTAAATGTATTAAATTAACAGAAATGAGAACACAAGGCA  
 TTCTGCAGTACAAACAAAGGAGCAATATGAACCTTGTTCATAGAGCTATTGCCAACTGTTGAAAAACAG  
 CTACAACTATATGAAATTCACTGGAGCTCAGAAAATTGCTGATGGAGTGAATGAAATTAAACACTGAAAACA  
 TGGTCAGCTCCATAGAGCCTGAAAAAAGATTCTCCTCCAAAACCACCAAGGACCCGCAAGTGCCT  
 TGTGAAGGGATGCTAAAGAAGAAATACTGCAGGCCACCGGAACTCATCCAGTGCACCCATCTTGACA  
 CCTCTCCCCCTCAGCTTTCCAACAGTCACTACTGTGTGCAGGACAATGATAGATAACCATCAAAGC  
 CAGTGTGCAATGGTTCATCAGAACACATTCAAGCAGACCTCAACAGAAACTATAGTAAATCAACAGA  
 ACTTCCAGGGAAAATGAATCAACAATTGAACAGATAGATAAAAATTGGAACGAAATTAAAGTTGAG  
 ATTAAGAAGGTCCTCTCCAAGAGGGACCAAAAGTTGATGGGAACACACTTTGAATAGGGACATG  
 CAATTAAAATTAATCTGTTCACCTGTATAGCTGATAAAATCTCTAACGCCACAGGAATTAAAGTTCAGA  
 TCTAAATGTCGGTGTAACTTCCCAGAATTCTTGTGTGGACTGCAGTGTAAACACAATCAAACAAAGTTCA  
 GTTACTCCACCCAGAAGAACATCCCAGAATTCAAGACACACCTCCAAGGCCAGACCGCTGCCTTGTGAGA  
 AAGGACATGTAACGTGGTACCTCATGGACCTGAAAATGCCATACCCATACCTGATTATCTGAAGGCAA  
 TTCCTCAGATATCAACTATCAAACACTAGGAAAACGTGAGTTAACACCAACTGCCTAACACAAGTTGAA  
 ACACCTGATCTGTGGTACATGATAACACTTCACACTCTCAGAACACCCCTCAGTTTACTAATCCAC  
 TTCACTCTGATGACTCAGACTCAGATGAAAGAAACTCTGATGGTGTGACCCAGAATAAAACTAATAT  
 TTCAACAGCAAGTGCACAGTTCTGCTGCAACTAGTACTGAAAGCATTCTACTAGGAAAGTATTGCCA  
 ATGTCATTGCTAGACATAATATAGCAGGAACACACATTCAAGTGTGAAAGATGTTGATGTTAGTG  
 AAGATTCACCTCCCTCCCTACCTGAAAGAACTCCTGAATGTTGTGTTAGCAAGTGAACATAAACACC  
 TGTAAGATCGGAATGGAGTGAACCTCAAAGTCAGGAACGATCTGAACAAAAAAAGTCTGAAGGCTTGATA  
 ACCTCTGAAAATGAGAAATGTGATCATCCAGCAGGGAGGTATTCACTATGAAATGTGATAGAATGTCCAC  
 CTACTTTCAGTGACAAGAGAGAACAAATATCAGAAAATCCAACAGAACAGCAGATATTGGTTTGGTAA  
 TCGATGTGGAAAACCAAAGGACCAAGAGATCCACCTCAGAATGGACATGATTCAAGGGAGCTAGAAGAC  
 ACTTTAAGTTACTGGAAAATTCAAGGTGCCACTGAAAGCCAGATTATAGTATTCCATCTTAAATATGT  
 GGGACTAACAGCAGTGTAGATTGTTACCTTAATTCTGCTGGACCATCTACCTGCCTTAACTACA  
 CTTAGGAAAAGTATTACATATGGTTATTGAAACTTCAAGTATTGCTCTTAAATGTCCTAACCC  
 TGTACACGCTGTTGTAGACATGTTAATATAGTAAATACCTTATGATATTGAGTTAAAGGACTACCC  
 TTTTCTGTTTATCATGATTCTATTGTTATGTACAGGGCAAGTAGGTATATAATTGATAAAG  
 TTGCAATTGAAATATTAAACAGAAAGATGTAAGAAATTCTGCATGGCTAAATCTTGTGACTTTAT  
 TTGAAATTATTGCTGGAGTTAGAAAATAGTTCTGAAATTAAACTTGCTGGATTCAAGC  
 AGCTTGCAGGTTATCAGAGATCAAAGATTGTAATAATAATTGTAAGCAAACATTCTGC  
 GPRDPPSEWT

Human PTPN12 protein sequence - var1 (public gi: 220034) (SEQ ID NO: 266)  
 MEQVEILRKFIQRVQAMKSPDHNGEDNFMRFLRRLSTKYRTEKLYPTATGEKEENVKKNRVKDILPF  
 DHSRVKLTLPKPSQDSDYINANFIKGVYGPKAYVATQGPLANTVIDFWRMVWEYNVVIIVMACREFEMGR  
 KKCEWLPYLEDPTIFAPFKISCEDEQARTDYFIRTLLEFQNESRRLYQFHYVNWPDHDPSSFDL  
 DMISLMRKYQEHEDVPICHCSAGCRTGAICAIDYTWNLLKAGKIPEEFNVFNLIQEMRTQRHS  
 EQYELVHRAIAQLFEKQLQYEIHGAQKIAIDGVNEINTENMVSSIEPEKQDSPPPKP  
 PRTRSCLEPGDAK  
 EEILQPPEPHPVPPILTPSPPSAFPTVTVWQDNDRYHPKPVLHMVSSEQHSADLN  
 RNYSKSTELPGKNE  
 STIEQIDKKLERNLSFEIKKVLQEGPKSFDGNTLLNRGHAIKIK  
 SASCPIADKISK  
 PQEELSSDLNVGDT  
 SQNSCVDCSVTQSNKVSVTPEESQNSDTPPRPDRPLP  
 LDEKGHTWSFH  
 GPN  
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 AIP  
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 QTRKTVSLPSPTTQVETPDLVDHDNTSP  
 LFR  
 TPLSFTNPL  
 HSDDSD  
 DERNSD  
 GAVTQNKT  
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 VSAATSTESTISTRKVLPM  
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 RHNIAGTTHSGAEKD  
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Human PTPN12 protein sequence - var2 (public gi: 7689910) (SEQ ID NO: 267)  
 VKRNRYKDLIPFDHSRVKLTLPKPSQDSDYINANFIKGVYGPKAYVATQGPLANTVIDFWRMVWEYNVVI  
 IVMACREF

Human PTPN12 protein sequence - var3 (public gi: 292409) (SEQ ID NO: 268)  
 MEQVEILRKFIQRVQAMKSPDHNGEDNFMRFLRRLSTKYRTEKLYPTATGEKEENVKKNRVKDILPF  
 DHSRVKLTLPKPSQDSDYINANFIKGVYGPKAYVATQGPLANTVIDFWRMVWEYNVVIIVMACREFEMGR  
 KKCEWLPYLEDPTIFAPFKISCEDEQARTDYFIRTLLEFQNESRRLYQFHYVNWPDHDPSSFDL  
 DMISLMRKYQEHEDVPICHCSAGCRTGAI  
 CAIDYTWNLLKAGKIPEEFNVFNLIQEMRTQRHS  
 EQYELVHRAIAQLFEKQLQYEIHGAQKIAIDGVNEINTENMISSIEPEKQDSPPPKP  
 PRTRSCLEPGDAK  
 EEILQPPEPHPVPPILTPSPPSAFPTVTVWQDNDRYHPKPVLHMVSSEQHSADLN  
 RNYSKSTELPGKNE  
 STIEQIDKKLERNLSFEIKKVLQEGPKSF  
 DGNTLLNRGHAIKIK  
 SASCPIADKISK  
 PQEELSSDLNVGDT  
 SQNSCVDCSVTQSNKVSVTPEESQNSDTPPRPDRPLP  
 LDEKGHTWSFH  
 GPN  
 E  
 AIP  
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 QTRKTVSLPSPTTQVETPDLVDHDNTSP  
 LFR  
 TPLSFTNPL  
 HSDDSD  
 DERNSD  
 GAVTQNKT  
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 VSAATSTESTISTRKVLPM  
 SIA  
 RHNIAGTTHSGAEKD  
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ELOSQERSEQQKSEGLITSENEKCDHPAGGIHYEMCIECPPTFSDKREQISENPTEATDIGFGNRGKPK  
GPRDPPEWT

Human PTPN12 pray sequence - var1 (SEQ ID NO: 129)

GTTCGGNATCTACAGGGNATGTTAATACCACTACAATGGATGATGTATAACTATCTATTGATGAT  
GAAGATACCCCACCAAACCCAAAAAGAGATCTTAAATACGACTCACTATAGGGCGAGCGCCGCATGG  
AGTACCCATACGAGCTTACAGATTACGCTCATATGCCATGGAGGCCAGTGAAATTCCACCCAAGCAGTGG  
TATCAACGAGCTGGAATTATGGCGCGCGCGCTCCGACGGAGGAGGGCGGGGAAGGAG  
GATGGAGCAAACAAAGTTTCACTTACCCACCAGAAGAACATCCAGAATTCAAGACACACCTCCAAGGCCAG  
ACCGCTTGCTCTTGATGAGAAAGGACATGTAACGTGGTCATTTCATGGACCTGAAAATGCCATACCCAT  
ACCTGATTTATCTGAAGGCAATTCCCTCAGATATCAACTATCAAACACTAGGAAAATGTGAGTTAACACCA  
AGTCCTACAACACAAGTTGAANGCACCTGATCTGAGTCATGATAACGCTTCACCACTCTCAGAACAA  
CCCCTCANTTTACTAATCCACTTCACTCTNATGACTCANACTCANATGAAAGAAAATCTGATGGTGCTG  
TGACCCANAATAAAACTAATATTCAACAGCAAGTGCACAGTTCTGCTGCCACTANTACTGAAAGCAT  
TTCTACTAGGAAAGTATTGCCNATGTCATTGCTAGACNTTATANCAGGAACANACATTAGGTGCTG  
AAAAAAANTTNATGTTNNNTGAANATTNNCTNCTCCNNCCCTNAANAACCTCC

Unigene Name: RALA Unigene ID: Hs.6906 Clone ID: 3GD\_1106

Human RALA mRNA sequence - var1 (public gi: 35845) (SEQ ID NO: 130)

ATGGCTGCAAATAAGCCCCAGGGTCAGAAATTCTTGGCTTACACAAAGTCATCATGGTGGGCAGTGGTG  
GCGTGGGCAAGTCAGCTCTGACTCTACAGTTCATGTCAGATGAGTTGTGGAGGACTATGAGCCTACCAA  
AGCAGACAGCTATCGGAAGAAGGTAGTGCTAGATGGGGAGGAAGTCCAGATCGATATCTTAGATAACAGCT  
GGGCAGGAGGACTACGCTGCAATTAGAGACAACACTTCCGAAGTGGGGAGGGGTTCTCTGTGTTTCT  
CTATTACAGAAATGGAATCTTGCAGCTACAGTGACTTCAGGGAGCAGATTAAAGAGTAAAAGAAGA  
TGAGAATGTTCCATTCTACTGGGTGGTAACAAATCAGATTAGAAGATAAAAGACAGGTTCTGTAGAA  
GAGGCAAAAACAGAGCTGACCAGTGGAAACTACGTCGAAACATCTGCTAAAACACGAGCTAATG  
TTGACAAGGTATTTTGATTTAATGAGAGAAATTGAGCAGGAAAGATGGAAGACAGCAAAGAAAAGAA  
TGGAAAAAGAAGAGGAAAGTTAGCCAAGAGAAATCAGAGAAAGATGCTGCAATTAA

Human RALA mRNA sequence - var2 (public gi: 24980846) (SEQ ID NO: 131)

CCGCTCCCCAGAGCAAAGCGTCGGAGTCCTCCCTCCCTCTCCCTCCCTCCCTCCAGCCG  
CCCAGGCTCCCCCGCCACCCGTCAGACTCCCTCCCTCGACCGCTCCCGCGGGGCTTCCAGGCACAA  
GGACCGAGTACCCCTCCGGCGGAGCCACGCAGCCGGCTTCCGGAGCCCTGGGGCGGGGACTGGCTC  
GCGGTGAGATTCTCTTAAATCCITTGGTAAAACGACAGACAAAATGGCTGCAAATAAGCCCAGGGT  
CAGAATTCTTGGCTTTACACAAAGTCATCATGGTGGCAGTGGTGGCGTGGCAAGTCAGCTCTGACTC  
TACAGTTCATGTACGATGAGTTGTGGAGGACTATGAGCCTACCAAAGCAGACAGCTATCGGAAGAAGGT  
AGTGTAGATGGGGAGGAAGTCCAGATCGATATCTTAGATAACAGCTGGCAGGAGGACTACGCTGCAATT  
AGAGACAACACTTCCGAAGTGGGGAGGGTTCCCTCTGTGTTTCTCTATTACAGAAATGGAATCTTIG  
CAGCTACAGCTGACTTCAGGGAGCAGATTAAAGAGTAAAAGAGATGAGAAATGTTCCATTCTACTGGT  
TGGTAACAAATCAGATTAGAAGATAAAAGACAGGTTCTGTAGAAGAGGCAAAAACAGAGCTGAGCAG  
TGGAAATGTTAACTACGTTGAAACATCTGCTAAAACACGAGCTAATGTTGACAAGGTATTTTGATTAA  
TGAGAGAAAATTGAGGCGAGAGAAGATGGAAGACAGCAAAGAAAAGAATGAAAAAGAAGAGGAAAAGTT  
AGCCAAGAGAAATCAGAGAAAGATGCTGCATTTTATAATCAAAGCCAAAATCCTTCTTATCTGACCAT  
ACTAATAAAATATAATTATAAGCATTGCCATTGAAGGCTTAATTGACTGAAATTACTTTAACATTGG  
AATTGTTGATATCACTAAAGCATGAATTGAACTGCAATGAAAGTCAAATTACTTTAACATTGGAAATT  
AATATGGCTTCACCAAGAAGCAAAGTCAACTTATTCATAATTGCTACATTATCATGGTCTGAAATG  
TAGCGTGTAAAGCTTGTGTTCTGGGAGCTTTCTGAAATTGAAAGAGGTGAAATGGGGTGGGGAGTG  
GGAGGAAAGGTGACTTCCTCTGGTGTATTATAAAGCTTAAATTATCATTAAATGTCTTGGT  
CTTCTACTGCCTGAAAATGACAATTGTAACATGATAGTTAAACTACCACTTTTTAACATTATTA  
TGCAAAATTAGAAGAAAAGTTATTGGCATGGTTGTGCATATAGTTAAACTGAGAGTAATTCTGTC  
AATCTGCTTAAATTACCTGGTAGTAACCTAGAAAAGTGGTAGAAACTCTGACATGGAATTGTA  
TGCCTTAAATTAGAAGAAAATCTGGTTATATCATTCTGGGTGTTCTTACTGACACCAGGGT  
CCGCTGCCCATGTGCTCTGGTAGAGAAAATATGCTGCCACAGCTTTCTGTAGAAGAAAATCTGAGAA  
GTAACGTCCGCTAGAAGTCTGCTCAAATTAAATGTTGTCATATTCTGGTTCTGAAAATAAGATT  
CAGAGCTTTGATCGCTTAAATTAAACTGCAAGGTCAATTGAGGAGGAGGAGGAGGAGGAGGAG  
AGATAATTTCAGCTGCAAGGATTCAAGCAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG  
GGTCCCTGGAAATCCCTTCTGCTAGTGGTAGCATGTAAGTGTAAAGTTTAAATCTGGGAGGAGGAG  
TAGGAAGAAAATGTCAGTAGTGTCAATGCAATTGCACTAGAACGCTTCGGGAAAATATTGCTGCT  
ATCTGTTCAATTCTAAATTATATTGATACAGTTGATACAGGAATTATTAGGAGTAATTCTT  
TCTGTTCTGTTATAATGAAAGAACACTGTAGCTACATTTCAGAAGTTAACATCAAGCCATCAAACCTG  
GGTATAGTGCAGAAAAGTGGCACACACTGACCACACATTAGGCTGTCACCATTGTTGTTGACCTG

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CTGGAAAGAATTCTAGCATGCTACTGGGGACATAATTCAGTGGAAATATGCCACTGACCGATTTTTT  
TTTTCTCTTTGCAGTGGGCTAGGACAGTGTGATTCAACAAAGTATTTTTCTTCAGTCCTA  
ATTTGAACAGGTCAAAGATGTGTTCAAGCATTCCAGGTAAACAGGTGTATGTAAGTTAAAATAGGCT  
TTTTAAGAACTCACTCTTAGATAATTACATCCAGCTTCTCATGTTAAATATTGTCCTAAAGGGTTG  
AGATGTACATCTTCATTCGTATTCATAGGCTATGCCATGTGCCAATTCAAGTTACCAATGTAAC  
ACTGCCAGCGGGCCCAGCAATCTCCATGTGTACTTATTACAGTCTTATTAAACAGGGTCTAACAC  
TAACATTGTGACTTTGCTTGAGACCTTCTCTGGTACTGAGGTGTATGAAGCCAATGACAAA  
GATGCATCACGTGTCTAGGCTATGCCACTACCCGATTGTTATTGCAATTGACCAATTAAAGAC  
CAATAAACCTCCTTTAAAAA

Human RALA mRNA sequence - var3 (public gi: 3483427) (SEQ ID NO: 132)  
ATAATCAAAGCCAAACTCCTTCATCTTGACCATAACTAATAAAATATAATTATAAGCATTGCCATTG  
AAGGCTTAATTGACTGAAATTACTTTAACATTGGAAATTGTTGTATATCACTAAAGCATGAATTGGA  
ACTGCAATGAAAGTCAAATTAACTTTAAAAGAAATTAAATATGGCTTCACCAAGAAGCAAAGTCAACCT  
ATTTCATAATTGCCATCAATTATCATGGCTCTGAATGTAGCGTGTAGCTGTGTTCTGGCAGTCTT  
TCTTGAAATTGAAGAGGTGAAATGGGGGGGGAGGGAGGAAAGGTGACTTCTCTGGTGTATTAT  
AAAGCTTAAATTATATCATTTAAATGTCTGGTCTTACTGCCCTGAAATTGACAATTGACAA  
ATGATAGTTAAACTACCACTTTTTAACATTATTATGCAAAAAAA

Human RALA mRNA sequence - var4 (public gi: 20147712) (SEQ ID NO: 133)  
ATGGTCGACTACCTAGCAAATAAGGCCAAGGGTCAAATTCTGGCTTACACAAAGTCATCGGGTGG  
GCAGTGGTGGCGTGGCAAGTCAGCTGACTCTACAGTTCATGTACGATGAGTTGTGGAGGACTATGA  
GCCTACCAAAGCAGACAGCTATCGGAAGAAGGTAGTGTAGATGGGGAGGAAGTCCAGATCGATATCTTA  
GATACAGCTGGCAGGAGGACTACGCTGCAATTAGAGACAACACTTCCGAAGTGGGGAGGGGTTCCCTCT  
GTGTTTCTCTATTACAGAAATGGAATTCTTACTGGTTGGTAACAAATCAGATTAGAGATAAAAGACAGGTT  
AAAAGAAGATGAGAAATGTTCAATTCTACTGGTTGGTAACAAATCAGATTAGAGATAAAAGACAGGTT  
TCTGTAGAAGAGGCAAAACAGAGCTGAGCAGTGGAAATGTTAACTACGTGGAAACATCTGCTAAACAC  
GAGCTAATGTTGACAAGGTATTTTGATTAAATGAGAGAAATTGAGCGAGAAAGATGGAAGACAGCAA  
AGAAAAGAATGGAAGGAAAGAGGAAAGTTAGCCAAGAGAATCAGAGAAAGATGCTGCATTATAA

Human RALA mRNA sequence - var5 (public gi: 10439805) (SEQ ID NO: 134)  
AGAATGGAAAAAGAAGAGGAAAGTTAGCCAAGAGAATCAGAGAAAGATGCTGCATTATAATCAA  
GCCCAAACCTCTTCTTATCTGACCATAACTAATAAAATATAATTATAAGCATTGCCATTGAAGGCTTAA  
TTGACTGAAATTACTTTAACATTGGAAATTGTTGTATATCACTAAAGCATGAATTGAACTGCAATG  
AAAGCTAAATTACTTTAAAAGAAATTAAATATGGCTTCACCAAGAAGCAAAGTCAACTTATTCTATAA  
TTGCCCTACATTATCATGGCTCTGAATGTAGCGTGTAGCTTGTGTTCTGGCAGTCTTCTGAAAT  
TGAAGAGGTGAAATGGGGGGGGAGTGGGAGGAAAGGTGACTTCTCTGGTGTATTATAAGCTTAA  
ATTTTATATCATTTAAAATGTCTGGTCTTACTGCCTTGAAATTGACAATTGTAACATGATAGTT  
AAACTACCACTTTTTAACCAATTATGCAAATTAGAGAAAAGTATTGGCATGGTGTGCATA  
TAGTTAAACTGAGAGTAATTCACTGTGAATTACCTGGTGTAGTAACCTAGAAAAGTGGTG  
TAAACTGTACATGGAATTGGTAATGCTGCTTAATTAGAGAAAATATCCGGTTATATCATT  
TGGGTGTGTTCTTACTGACACCAGGGGTCGCCATGTGCTGGTGTAGAGTGTGTTGACTGCA  
CAGCTTGTGTTAGAAAATCTTGAGAGTAACGTGCTGGTGTAGAGTGTGTTGACTGCA  
CATATTCTGGTCTTGAAAATAGATTCCAGAGCTTGTGATCGCTTTAATAAACTGCAAGTCATT  
AATTGAAGGGCAGCATATATACTTGCAAGATAATTTCAGCTGCAAGGATTGAGCACCAGTTGTTG  
AATGAACCCCTCTTCTCTGAGATTCTGGTCCCTGGAAATCCCTTCTGCTAGTGGTGAGCATGTAAGT  
GTTAAGTTTTAATCTGGGAGCAGGGCATAGGAAGAAAATGTCAGTAGTGCTAATGCAATTGCACTAGA  
ACGCTCGGGAAAATATTGCTGCTGGCATCTGTTCAATTCTAAATTGCAAGTTACAGTTG  
ATACAGGAATTATTAGGAGTAATTCTTCTGTTCTGTTATAATGAAAGAACACTGAGCTACATTTC  
AGAAGTTAACATCAAGCCATCAAACCTGGGTATACTGAGAAGACGTGGCACACACTGACCCACATTAG  
GCTGTGTCACCATGTTGAGCTGGTGTACCTGCTGGAAAGAATTCTAGCATGCTACTTGGGACATAATT  
GGGAAATATGCCACTGACCCATTCTTCTGAGCTGGTGTAGGGCAGTGTGATTCAACA  
AAGTATTCTTCTCTGAGCTGGTGTACCTGCTGGAAAGAATTCTAGCATGCTACTTGGGACATAATT  
AGGTGTGTATGAAAGTTAAAATAGGCTTTTGTAGGAAACTCACTCTTGTGTTATTACATCCAGCTTCTC  
ATGTTAAATATTGCTTAAAGGGTTGAGATGTACATCTTCAATTGTTGTTGTTGTTGACTGCT  
ATGTGCGGAATTCAAGTTACCAATGTAACACTGGGAGCAGGGCCAGCAATCTCCATGTGTACTT  
AGTCTTATTAAACAGGGTCTAACCAACTAACATTGTGACTTTGCTTGTAGGCTATGCCACTACCCGATTG  
ACTGAGGTGCTATGAAGCCAATGACAAAGATGCACTCACGTGTCTTAGGCTATGCCACTACCCGATTG  
TTTATTGCAATTGAGCCATTAAAGACCAATAACTCCTTTAAAAA

Human RALA Protein sequence - var1 (public gi: 35846) (SEQ ID NO: 269)

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MAANKPKGQNSLALHKVIMVGSGGVGKSALTQFMYDEFVEDYEPTKADSYRKVVLDGEEVQIDILD  
TA  
GQEDYAAIRDNYFRSGEGFLCVFSITEMESFAATADFREQILRVKEDENVPFLLVGNKSDLEDKRQVSVE  
EAKNRAEQWNVNYVETS A KTRANVDKVF DLMREIRARKMEDSKEKNGKKRKS LAKRIRERCCIL

Human RALA Protein sequence - var2 (public gi: 20147713) (SEQ ID NO: 270)  
MVDYLANKPKGQNSLALHKVIMVGSGGVGKSALTQFMYDEFVEDYEPTKADSYRKVVLDGEEVQIDIL  
DTAGQEDYAAIRDNYFRSGEGFLCVFSITEMESFAATADFREQILRVKEDENVPFLLVGNKSDLEDKRQV  
SVEAKNRAEQWNVNYVETS A KTRANVDKVF DLMREIRARKMEDSKEKNGKKRKS LAKRIRERCCIL

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Unigene Name: SIAH1 Unigene ID: Hs.295923 Clone ID: 3GD\_150

Human SIAH1 mRNA sequence - var1 (public gi: 27503513) (SEQ ID NO: 135)  
CCAGCGCGTCCCCCTGCATCCGTGGCCTCACTGGAGCTGGCAGGACCTACCCAGTGAATCTGGAG  
AAAACAAACTTGGGAGACAGACGAAAGCTTAGGCACATTGGAGGACAGCGCAGCTGTGGCTCCATT  
TGGAGATGCAGTCGAATTGAGCTCACAGGGAGGTGTGGTGCCTCCTGGGATGGAAAGGCTCCTTT  
TCCACCTCTGTAACTGGTGTCTGAGAAGTAAATGGTATTGGATCCTGACCTCAGACGTGAATTGGG  
TCTTCTGTGCTAGGAGCAGAAAGAGCCCAGGAGGGCCTGTCCCTTACTCTGGGGAAACGCAATG  
CGTGGCCTGACTCTCATGACGGAAAGGCTACTCCACCTCTGTACTCCTGGAGGGAGTCTGTT  
ACATGTTTACCAAGCGGCCAGGACAAGGAAGAGAAAAGAAATGAGCCGTAGACTGCTACAGCATTAC  
CCGGTACCTCGAAGTGTCCACCATCCCAGAGGGTGCCTGACTGGCACAAGTGCATCCAACATGA  
CTTGGCGAGTCTTTGAGTGTCCAGTCTGCTTGACTATGTGTTACCGCCCATCTCAATGTCAGAGT  
GGCCATCTGTTGTAGCAACTGTCGCCAAAGCTCACATGTTGCTCAACTTGCCTGGGGCCATTGGGAT  
CCATTGCGAACTTGGTATGGAGAAAGTGGTAATTCACTTTCCCCCTGAAATATGCGTCTCTGG  
ATGTGAAATACTCTGCCACACACAGAAAAAGCAGACCATGAAGAGCTCTGTGAGTTAGGCCTATT  
TGTCCGTGCCCTGGTCTCTGTAAATGGCAAGGCTCTGGATGCTGTAATGCCCATCTGATGCATC  
AGCATAAGTCCATTACAACCCATACAGGGAGAGGAATAGTTTCTGCTACAGACATTAATCTCTGG  
TGCCTGTTGACTGGGTATGTCAGTCTGTTGGCTTCACTTCATGTTAGTCTTAGAGAAACAGGAA  
AAATACGATGGTCAACAGCAGTCTCGCAATGTCAGCTGATAGGAACACGCAAGCAAGCTGAAAATT  
TTGCTTACCGACTTGAGCTAAATGGCATAGGCAGCATTGACTTGGGAAGCGACTCCTCGATCTATT  
TGAAGGAATTGCAACAGCATTATGAAATAGCAGTCTAGTCTTGACACCAGCATTGACAGCTTT  
GCAGAAAATGCAATTAGGCATCAATGTAACATTTCATGTTGAAATGCAATCAAACATTCTG  
GCCAGTGTAAAACCTCAGTTCAACAGAAAATAGGCACCCATCTGTCGCCAACCTAAAACCTTCTG  
GTAGGTGGAAGCTAGACACATGAAGGTAATAAAAAGAAGGCTGTTAAATACAGGAAACAGTGGCATG  
AGTAACACTAATATATTAAAATAAGTCAACAGTAAACCAACTGAAAATATATGTTATACACCCAAAG  
ATGGGCATCTTGTATTAAGGAAAGCATTGTAACATAATTCTGAGTTGTGTTGTTGAGATTG  
ATTGTATTGTTGAAAAGTTGTTTGTGCTGGGAGTGTGCTGCCCTGGGTGTGCGTGTGTTGGGTT  
TTTCTCTTAACTGACAAGCCATCTGAGTGGTCACTGGCCACTGCTTCTTGTGAGTCATACA  
TAGTGTGCTGTGTGCTTTTGTGTTATTGCTAATTTTTATTAAATTAGTTGCTTCAATTAAATAAA  
TTTGACTTTCTGTAATTCACTGAGTTTCTCTTGTGCTTCAATTAAAGTTAGTATCTTGTATGCA  
TATTGTTTATGTTAAAATTTATAACGTTCAATTTCCTTCCCCCTTAATCAGTTCAATTAGA  
AATATTAAACAGCTATTGTAAGGCCATGAGTCCAGAAAAGTAAAGGTGACATCGGAAAATAAT  
CAAAGCTATTAAAGCATCTATAAGGTGCTCTCTCTGCTTCTACAGATGAGTCACACCTTGAGCT  
TAATCTTGAAAGGTTAGAGAATAAAATTGATTTTATAAAACTGCAAATCAGGTTTGTCTTCTTT  
CAGATATCTGGACAAATCACATATTAAAATTGTTCTGTATTGTTTGTGAGAAGAAGGCAT  
CGTCATGCACAGTATTGTAATTAAAGCAAATCATTGTTAAAAGGCAAGTTGCAAAAAATGTTT  
GGTCTTTATAATTCTCATTAAAAGAATATCTGCAAATTAAAAAAAAGAAAAAAAAGAAAAAAA  
AAAAAAAAAAAAAAAAGAAAAAAAAGAAAAAAAAGAAAAAAAAGAAAAAAAAGAAAAAAAAGAAAA  
AAAA

Human SIAH1 mRNA sequence - var2 (public gi: 4506946) (SEQ ID NO: 136)  
GCGGCGGCCAGGGGGAGCCGGGGCGCCGTTGCGGGGCGCCTCTCGAGAGGGCGGGCGGCCAGGGT  
TCCCGTCCGTCTCGCGCCGGGAAGAGGGCGGTGCGCTGCCCGGGTGGCGACGGAGCGC  
GTGGTGCAGGACGGGGTCCGAGGGCGCTCTCCGCCACAGAAAATGAGCCGTAGACTGCTACAGCA  
TTACCTACCGGTACCTCGAAGTGTCCACCATCCAGAGGGTGCCTGCCCTGACTGGCACAAGTGCATCA  
ACAATGACTTGGCAGTCTTTGAGTGTCCAGTCTGCTTGACTATGTGTTACCGCCATTCTCAATG  
TCAGAGTGGCCTATTGTTGAGCAACTGTCGCCAAAGCTCACATGTTGCTCAACTTGCCTGGGGCCCT  
TTGGGATCCATTGCAACTTGGCTATGGAGAAAGTGGTAATTCACTTGTGAGTTAGTCTTGTGAG  
CTTCTGGATGTGAAATAACTCTGCCACACAGAAAAGCAGACCATGAAGAGCTCTGTGAGTTAGGCC  
TTATTCTGTCCGTGCCCTGGTGTCTCTGTAAATGGCAAGGCTCTGGATGCTGTAATGCCCATCTG  
ATGCATCAGCATAAGTCCATTACAACCCATACAGGGAGAGGAATAGTTTCTGCTACAGACATTAATC  
TTCTGGTGTGTTGACTGGGTATGTCAGTCTGTTGCTTCACTTCATGTTAGTCTTAGAGAA  
ACAGGAAAATACGATGGTCACCGAGCAGTCTCGCAATGTCAGCTGATAGGAACACGCAAGCAAGCT  
GAAAATTTGCTTACCGACTTGAGCTAAATGGCATAGGCCACATTGAGACTTGGGAAGCGACTCCTCGAT  
CTATTGATGAAGGAATTGCAACAGCATTATGAAATAGCAGTCTAGTCTTGACACCAGCATTGACA  
GCTTTTGAGAAAATGCAATTAGGCATCAATGTAACATTTCATGTTGAAATGCAATCAAACA  
TTTCTGGCAGTGTAAAACCTCAGTTTACAGAAAATAGGCACCCATCTGTCGCCAACCTAAAAC  
TCTTCGGTAGGTGGAAGCTAGACACATGAAGGTAATAAAAAGAAGGCTGTTAAATACAGGAAACAGT  
TGCATGTTAGTAAACTAATATATTAAAATAAGTCAACAGTAAACCAACTGAAAATATGTTATAC  
ACCCAAAGATGGCATCTTTGTTATTAGAAAGGAAAGCATTGTAACAAATTCTGAGTTTGTGTTG  
TAGATTGATTGTTATTGTTGAAAAGTTGTTTGTGCTGCCGTGGAGTGTGCGCTGCGTGGGTGCGTG  
TTGGTTTCTTAACTGACAAGCCATCTGAGTGGCATGGCCACTGCTTCCCTTGTGAGTCAT

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ACATAGTGTGCTGTTGGCTTGTGTTGCTAATTAACTTAAAGTTAGTTTCACTAAAT  
AAATTGACTTTCTGTAATTCAAGGTTTCTTCTTGTACCAATTAAAGTTAGTATCTTGTATAT  
GCATATTGTTATGGTAAAAAATTATAACGTGTCATATTCTTCCCATTAATCAGTCATT  
AGAAATTAAACTCAGTATTGAGGCTGAGGTCAGAGAAAGTAAAGGTGACATCGGAAAAT  
AATCCCAAGCTATTAAAGCATCTATAAGGTGCTCTTCTGCTTCTACAGATGAGTCACACCTTGA  
GCTTAACTTGAGGTTAGAGATAATTGATTAAATAGCAAATCAGGCTTGTCTTCTT  
CAGATATCTTGACAAATCACATATTAAAATTGTTCTGATTATTGGTTTGAGAAGAACAT  
CGTCATGCAAGTATTGTAATTAAAGCAAATCATTGTTAAAAGCAGTTGCAAAAATGTTT  
GGTCTTTATAATTCTCA

Human SIAH1 mRNA sequence - var3 (public gi: 16551141) (SEQ ID NO: 137)  
TTTATAATAGCCCTCCAAATGGGTGACGTATTGATTCTATGTCCTAATGACTAGTGTGAGC  
ATTTCTAGCATTGATTAAAGATGTTACCCAAAGACCCCTGTATCAAATAAGCTGGATTTTAT  
TGAAAATTATAACTCTAGAAATTAGTTAAACTAGACTTAGGGATATGTGATTAACTGGTATTCC  
ACGTTTATGCACTGGTTTAAACTCTCAAGTATTAAACTAAAGCTTGGTCTTGTCTTATCA  
AGAAATCCTACACTGTCCACTGGAGACATCCATGTTTACTGGCTGCCCCCTTAGTGGTCCGTG  
AACCTTACCTCAAACCATGCACTGGGGCAGAGATCCTTACTTGCTGGTTACAAATGCAAATACAG  
TGAAGAATGTCATTTGTGATTGTTCTGAAATAGTTCAAGGAAATCCATGACCGTAAAGTACTGTGA  
TAGTGATGTCACCACTGTGAGCTTCACTAGGTGATTGGTCTGCAATTACAGTGACCAAATCAGC  
TATGTTGCCAGTAATTCACTGCTGAGGGCTTTGGATTTCCTTATGAAACTACTGAAATGAGGTCAC  
TGACTATTACTAAGGGACATTGCTACAAAGAATGTTAGTTGGTGTTCATGAAGTAACATGTTAA  
TTATTTAACCCAGGATTAGATGTAACACATCAAGTAGTTGGTGTTCATGAAGTAACATGTTAA  
GCTCACATTGAAAGTACTTCAGTCTTCAATTGCCATGAAATTGATTCAGCAGCTAAAAAAAAAAA  
AAAAAAAGACTACAGTTAGTCATTACCAATTGATGATTATGGTCAAACACTAATGCTATT  
TGTTTTTACAAACATTGGGATACCACAATGAAACTGACTTAAACAAATGCTGAAAGA  
GGAAGGAAATATCAAACAGGCTGAATAGACAAACAGGAAATATGCTCCACCTACCGAAAGAGTTT  
GTTGGCAGACAGATGGTGCCTATTCTGTGAAACTGAAGTTAAACACTGGCAGAAAATGTTGA  
TTGCCATTCAACACATGAAATAGTTACATTGATGCCATTCTGCAAAAGCTGTGAA  
TGCTGGTGTCAAAGACTAGACAGTCGCTATTCTATAATGGCTGCAATTCTCATGAATAGATCGAGG  
AGTCGCTTCCAAGTCATCGTCGCTATTGACCTTACTGCTCAAGTCGTAAGCAAAATTTCAGCTTGC  
TTGCGTGTCTTATCAGCTGTACGATTGCAAGAATGCTGGTACCATCGTATTCTGTCTCTA  
AGACTAACATGAAAGCAAAACAGGACTGCACTCATCACCCAGTCACAGCACCAGGAAGATTAA  
GTCTGTAGCAAGAAAATATCCTCTCTGGTGTAGGGTTGTAATGGACTTATGCTGATGCATCAGATGG  
GGCATTACAGCATCCAGAGGAGCCTGCCATTACAGGAAGCACCAGGGCACGGACAGGAATAAGGCTAA  
ACTCACAGAGCTTCTCATGGTGTCTGGTGTGGAGGTATTTCACATCCAGAAGACGCATA  
TTTACAGGGAAAAGACTGAAATTAGCATTCTCCATTCTCCATAGCAAGTGGCAATGGATCCAAAGGGCC  
CGGCAAGTGGACAACATGAGCTTGGCGACAGTTGCTACAAACAAAGATGCCACTCTGACATTGAA  
GAATGGGCGGTAAACACATAGTCAAAGCAGACTGGACACTCAAAAGACTGCCAAGTCATTGTTGGATGC  
AGTTGTGCCAGTCAGGGCAGGCACCCCTGGGATGGTGGACACTTCGAGGTACCGGTAGGTAATGCTGTA  
GCAGTCTGACGGCTATTCTGAAATAACATAAGGAGGCAGGAGAAAATAATTAAACCATGACTT  
ACTTATAAATAATGTTACATGCCATAAGTCCTTAAAGTTACACAAAATTACTGAGCAAAGAG  
GAAGAAAATAGGATTAAAAAGATATT

Human SIAH1 mRNA sequence - var4 (public gi: 21753769) (SEQ ID NO: 138)  
TTTCACCCCAAGACAAATAGTGGCTGCCATTCCAGGCCAGGTAGCTCTGGAAAAGTGTGTTGT  
TTTATCTTGACTCAGCTGGTAGTTACATTGTCGATTATTCCTCCAGATGATATTACCTGTTAAAT  
AATGTTTATTACTCTGCTGATGAATGTTTCAGCAACGCTGGAGAACCTAGGCTGCAAGGGGTTCTCA  
CCTGTTGACTCCATCCCCAACCCAGTATGGCATATATCTGCGCTGCTATCATCTTATTCTTCT  
TTTCATTGTCCTCCCTTGTCAATTAGTGTGACACATATTGTTGAAAGTAAAGCTGTTAAAGTAG  
AACAGAAAGATAACTTTCTTCTACAGACTAAAAGTTTGTGAGATGGCCCTCCATTCTCCATGCC  
CTTCACCTTAGTTGTTTATTTCATTTCTGGCCACCTCACTAGCGAGTACATCCCTCAC  
TCTTGAGGTGGCACTGATCAGTAGGAAATAAGTTAACACCTGGCTGGTATAATTGGGGGAAGACT  
TAATTAGATAGAGATGGATAATGGGATGGCAGACCTTCCCCTTGACCCCTCCCTATTCAA  
AATACACCTCTAGAGTAGATAATTGCTTACCATTAAGAAGAGTTAATGGAAGGTGATACTCTGATTCTT  
GGCATTGGAACACTACATTCAATCCGGTATCCTCGGATTAGTTCTAGGACCCCTCTCCATACCAAAAC  
CTGAGGTGGTCAAGTCGCTGATAGAAAATGGTGTCAATTGTTGATGTCATATTCTCTTGATAATT  
AGTGATCTGGATTACTTAATACAATGAAACATATGAAATAGTTGTTATAGACTGTTAAAGTAG  
TTTGTTGATTCTTATAAATTCTGAAATATTTCATGCCATTCCATGGCTGGTGAAGTCCTCGGATGAGACCG  
TGTGGATACAGAGTGGCAGTTTATCAGGAGGTTACCTGTAACCTCCCTGACCTATCAACAGCTGACTC  
CAAATTAGAAGAAATAGAGTAAGGGAGGCCTCAGGGAGAGTCCAGCAAACGGATTGCAATTAAACTTC  
GTCCCTTGTATAGTTCTTAGTTGTTATGGTCCATTCTTCTATTAGCATTTGTTATCTATGAGTC  
TATCCAAAGACGATTAAGGGAGTTCCACATGTTCCGGAACATTGAAAAGAGCTTATCCAGTGTAA

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CAGATCCTAATAAAGTGCACATTCACTGTAATTTATTTTTAATATCTTTTAATCCTATTTCTT  
CCTCTTTGCTCAGTAAATTGTATGAAACTTAAAAGGACTTATGGCATGAAACATTATTTATAAG  
TAAGTCATGGTTATAATTATTTCTCCGCCTTATGTATTTCAGAAATGAGCGTCAGACTG  
CTACAGCATTACCTACCGTACCTCGAAGTGTCCACCATCCCAGAGGGTGCCTGCCCTGACTGGCACAAAC  
TGCATCCAACAATGACTTGGCAGTCTTTGAGTGTCCAGTCTGCTTGAATATGTGTTACCGCCATT  
CTTCAATGTCAGAGTGGCCATCTTGTGTTGAGCAACTGTCGCCAAAGCTCACATGTTGCTTCAACTTGCC  
GGGGCCCTTGGGATCCATTGCAACTTGGCTATGGAGAAAGTGGCTAATTCACTGACTTTCCTGTAA  
ATATGCGTCTCTGGATGTGAAATACTCTGCCACACACAGAAAAAGCAGACCATGAAGAGCTGTGAG  
TTTAGGCCTTATCTGTGCGCTGGTCTCTGTAATGGCAAGGGCTCTGGATGCTGTAATGC  
CCCACGATGTCAGCATAAGTCCATTACACCCCTACAGGGAGAGGATATAGTTTCTTGCTACAGA  
CAATTAACTCTCCTGGTCTGTTGACTGGGTGATGTCAGTCTGTTGGCTTCACTCATGTTAGTC  
TTAGAGAACAGAAAAATTCGATGGTCACTGAGCTAATGGTCACTGGCAGCATTGACTGGGAAGCGAC  
AGCAAGCTGAAAATTGCTTACCGACTTGGAGCTAATGGTCACTGGCAGCATTGACTGGGAAGCGAC  
TCCTCGATCTATTCACTGAAAGGAAATTGCAACAGCCATTATGAATAGCAGTCTAGTCTTGGCACCAGC  
ATTGACAGCTTTGCAAGAAAATTGGCAATTAGGCATCAAGTAACTATTCCATGTTGAAATGGCA  
ATCAAACATTTCCTGGCCAGTGTAAAACCTCAGTTTACAGAAAATAAGGCACCCATCTGCTGCCAA  
CCTAAAACCTTCCGGTAGGTGGAAAGCTAGACACATGAAGGTAATAAAAAGAAAGGCTGTTAAATACAG  
GAAACAGTTGCACTGAGTAACACTAATATTTAAAATAAGTCAACAGTAAACCACTGAAAAAATATAT  
GTATATACACCAAGATGGCATTGTTGTTAAGAAGGAGCATTGTAATAATTCTGAGTTTGT  
GTTTGTGAGATTGATTGATTGTTGAAAAGTTGTTGGCTGGAGTGTGCTGCGTGGGTGT  
GTGCGTGTGTTGGGTTTTCTCTTAACTGACAAGCCATCTGAGTGTGCTGCGTGGGCACTGCTTCCCT  
TTGAGTCAATACATAGTGTGCTGTTGCTGTTGTTGTTGTTGCTAATTTTATTAATTAGT  
TTTCATTAAATAATTGACTTTCTG

Human SIAH1 mRNA sequence - var5 (public gi: 3041824) (SEQ ID NO: 139)  
ATGAGCCGTCAGACTGCTACAGCATTACCTACCGTACCTCGAAGTGTCCACCATCCCAGAGGGTGCCTG  
CCCTGACTGGCACAACTGCACTTCAACAAATGACTTGGCAGTCTTTGAGTGTCCAGTCTGCTTGTACTA  
TGTGTTACCGCCATTCTCAATGTCAGAGTGGCATTCTGTTGAGCAACTGTCGCCAAAGCTCAC  
TGTTGCTTCAACTTGGGGCCCTTGGGATCCATTGCAACTTGGCTATGGAGAAAGTGGCTAATTCA  
TACTTTCCCTGTAATATGCGTCTCTGGATGTGAAATAACTCTGCCACACACAGAAAAAGCAGACCA  
TGAAGAGCTGTGAGTTAGGCCTTATTCTGTGCGCTGGTCTCTGTAATGGCAAGGCT  
CTGGATGCTGTAATGCCCATCTGATGCACTGCAAGTCAATTACACCCCTACAGGGAGAGGATATAG  
TTTTCTTGCTACAGACATTAAATCTCTGGTCTGTTGACTGGGTGATGCACTGCTGTTGGCTT  
TCACCTCATGTTAGCTTAGAGAAAACAGGAAAATACGATGGTCACCAGCAGTTCTGCACTGTCAG  
CTGATAGGAACACGCAAGCAAGCTGAAAATTGCTTACCGACTTGAGCTAAATGGTCACTGGGACGAT  
TGACTTGGGAAGCGACTCTCGATCTTCACTGAGGAAATTGCAACAGCATTATGAAATAGCAGTGTCT  
AGCTTTGACACCAGCATTGCAAGCTTTGCAAGAAAATGCAATTAGGCACTGAACTATTCC  
ATGTTGAAATGGCAATCAAACATTCTGGCCAGTGTAAAACCTCAGTTCAAGAAAATAAGGCA  
CCCATCTGCTGCCAACCTAAAACCTTCTGGTAGAGCTAGACACATGAAGGAAATAAAAAGAA  
AGGCTTAAATACAGGAAAAGCTTCACTGAGTAACACTAATATTTAAAATAAGTCAACAGTAAAC  
CACTGAAAATATATGTATATACACCAAGATGGCATCTTGATTAAGAAGGAAAGCATTGAAAA  
TAATTCTGAGTTTGTGTTGTTGAGATTGATTGATTGTTGAAAAGTTGTTGGCTGGAGTGT  
GTGCGTGTGCGTGGGTGTGCGCTGTTGGGTTTTCTCTTAACTGACAAGCCATCTGAGTGTGCTG  
GCCACTGCTTCCCTTGTGAGTCAATACATAGTGTGCTGTAAGCCGTTTGTGTTGCTAAT  
TTTATTAAATTAGTTCTGTTAAATAATTGACTTTCTGTAATTCACTGTTTCTGTTTGT  
CCATTAAAGTTAGTATCTTGTGATATGGCATATTGTTATGGAAAAAAATTATAACGGGTTCAATA  
TTTCTTTCCCCATTAAATCAAGTCATTGGAAATATTAAAACCGCCATTGGTGAACCCATGA  
GTTCCCAGAAAAGTAAAGGTGACACCCGAAAATAATCCAAAAGCTTAAAGCCACCTATAAGGTGC  
CCCCCTTCTGCTTCCCTACAGATGAGTCACACCTTGAGCCTTAACCTTGAAGGTTAGAGAATAAA  
TTGATTAAATTAAATCTGCAAATCCAGGCTTTGTTCTTCCAGATATCTGGACAAATCACAT  
ATTAAAATTGTTCTGTTTATTGTTGAGAAGGCACTGTCATGCACTGTTGTAATT  
AAAAGCAAATTCTGTTAAAAGGCAGTTGCAAAAATGTTGCTTTATAATTCTCA

Human SIAH1 mRNA sequence - var6 (public gi: 17390431) (SEQ ID NO: 140)  
CGGCGCCGGGAAGAGGCGGTGGCGTGCCTGGCGGGGTTGGCGACGGAGCGCTGGTGC  
ACGGGGTCCGAGGCGCGTCTCCGCCACAGAAATGAGCGTCAGACTGCTACAGCATTACCGGT  
ACCTCGAAGTGTCCACCATCCCAGAGGGTGCCTGCCCTGACTGGCACAACCTGCATCCAACAATGACTTGG  
CGAGTCTTTGAGTGTCCAGTCTGCTTGAATGTTACCGCCATTCTCAATGTCAGAGTGGCCA  
TCTGTTGAGCAACTGTCGCCAACAGCTCACATGTTGCAACTTGGGGCCCTTGGGATCCATT  
CGCAACTGGCTATGGAGAAAGTGGCTAATTCACTGACTTTCCCTGTAATATGCGTCTCTGATGTG  
AAATAACTCTGCCACACACAGAAAAAGCAGACCATGAAGAGCTGTGAGTTAGGCTTATTCTGTCC  
GTGCCCTGGTCTGCTGTAATGGCAAGGCTCTGGATGCTGTAATGCCCATCTGATGCACTGAGC

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AAGTCCATTACAACCCCTACAGGGAGAGGATATAGTTTTCTTGCTACAGACATTAATCTCCTGGTGCTG  
TTGACTGGGTGATGATGCAGTCCTGTTGGCTTCACTTCATGTTAGTCCTAGAGAAACAGGAAAATA  
CGATGGTCACCAGCAGTTCTCGCAATCGTACAGCTGATAGGAACACGCAAGCAAGCTGAAAATTTGCT  
TACCGACTTGAGCTAAATGGTCATAGGCAGCATTGACTGGAGCTGACTTGGACACAGCATTGCACAGCTTTTGAG  
GAATGCAACAGCATTATGAATAGCAGCTGCTAGTCTTGACACAGCATTGCACAGCTTTTGAG  
AAAATGGCAATTAGGCATCAATGTAATTTCCATGTTGAATGGCAATCAAACATTCTGGCCA  
GTGTTAAAATTCAGTTCAAGAAAATAAGGCACCCATCTGCTGCCAACCTAAACTCTTCGGTAG  
GTGGAAGCTAGACACATGAAGGTAATAAAGAAGGCTGTTAAATACAGGAAACAGTTGATGAGTA  
ACACTAATATTTAAAAATAAGTCACAGTAAACCACTGAAAAATATATGTATACACCCAAAGATGG  
GCATTTGTATTAAGAAGGAGCATGTTAAATCTGAGTTGTGTTGTTGAGATTGATTG  
TATTGTTGAAAAAGTTGTTTGCCTGGGAGTGTGCTGCGTGGGTGTCGTGCTGTTGGGTTTTT  
TCCTTAACGACAAGCCATCTGAGTGGTCATGGCCACTGCTTTCCCTTGAGTCATACATAGT  
GCTGCTGTTGCTTGTGTTGAGTCTTGTGTAATTGTAATTGTTAGTTTCAATTAAATAATTG  
ACTTTCTGTAATTCAAGGTTTTCCCTTTGTACCATTTAAAGTTAGTATCTTGATATGCATATT  
TGTTATGGAAAAATTATAACGTGTTCAATATTCTTCCCCATTAAATCAGTTATTAGAAATA  
TTTAAATCAGCTATTGAGGCAAGTCCAGAAAGTAAAGGTGACATCGGAAAATAATCAA  
AGCTATTAAAGCATCTAAAGGTGCTCTTCTGCTTACAGATGAGTCACACCTTGAGCTTAAT  
CTTGAAGGTTAGAGATAATTGATTTTATAAATACTGCAAAATCAGGTTTGTCTTCCCTTCA  
TATCTTGGACAATTCAATTAAATTGTTCTGTATTATTGGTTTGAGAAGAAGGCACTGTC  
ATGCACAGTATTGTAATTAAAGCAAATCTTGTAAAAAGGCAAGTTGCAAAATGTTGGTC  
TTTATAATTCTCAATTAAAGAAATATCTGCCATTTTAAAAAAAAAAAAAAAAAAAA  
AAAA

Human SIAH1 mRNA sequence - var7 (public gi: 23274141) (SEQ ID NO: 141)  
GTCCCGTCGGTCTGGCGCGGGAAAGAGGGCGGTGGCGCTGCCCGCGTGGCGGGGGTTGGCGACGGAGCG  
CGTGGTGCAGGACGGGGTCCAGGGCGCTCTCCGCCACAGAAATGAGCCGTAGACTGCTACAGC  
ATTACCTACCGGTACCTCGAAGTGTCCACCTCCAGAGGGTGCCTGCCTGACTGGCACAACTGCATCC  
AAACATGACTTGGCGAGTCCTTGAGTGTCCAGTGTGCTTGACTATGTGTTACGCCATTCTCAAT  
GTCAGAGTGGCATCTGTTGTAGCAACTGTGCCAAAGCTCACATGTTGTCACATTGCCGGGCC  
TTTGGGATCCATTGCAACTTGGCTATGGAGAAAGTGGCTAATTCAAGTACTTTCCCTGTAATATGCG  
TCTCTGGATGTGAAATAACTCTGCCACACAGAAAAGCAGACCATGAAGAGCTGTGAGTTAGGC  
CTTATTCTGTCGTGCCCTGGTCTCTGTAATGGCAAGGCTCTGGATGCTGTAATGCCCATCT  
GATGCATCAGCATAAAGTCCATTACAACCCCTACAGGGAGAGGATAGTTTCTGCTACAGACATTAAT  
CTTCTGGTGTGTTGACTGGGTGATGAGTCAGTCTGCACTGCAAGCTGATAGGAACACGCAAGCAG  
AACAGAAAATACGATGGTCACCAGCAGTTCTGCACTGCAAGCTGATAGGAACACGCAAGCAG  
TGAAAATTGCTTACCGACTTGAGCTAAATGGTCATAGGCAGATTGACTTGGGAAGCGACTCTCGA  
TCTATTCTGAGGAAATTGCAACAGCATTATGAATAGCGACTGTCTAGTCTTGGACACCAGCATTGAC  
AGCTTTTGCAAGAAAATGGCAATTAGGCATCAATGAACTATTTCATGTTGAAATGGCAATCAA  
ATTTCATGGCCAGTGTAAACTTCAGTTCACAGAAAATAGGCACCCATCTGCTGCCAACCTAAA  
CTCTGGTAGGTGGAAGCTAGACACATGAAGGTAATAAAGAAGGCTGTTAAATACAGGAAACAG  
TTGCATGTAGTAACACTAATATATTAAAATAAGTCACAGTAAACCACTGAAAAATATATGTATATA  
CACCCAAGATGGCATCTTGTATTAAAGAAAGGCACTGTAATAATTCTGAGTTTGTGTTGTT  
GTAGATTGATTGATTGTAAGGAAAAAGTTGTTGGCTGGGAGTGTGCTGCGTGGGTGTCGTG  
TTGGGTTTTCTTAACTGACAAGGCATCTGAGTGGTCATGGCCACTGCTTTCCCTTGTGAG  
TCAATACATAGTGTGCTGTTGCTTGTGTTGTTGTTGCTAATTATTAAATTGTTGTTTCA  
TAAATAATTGACTTTCTGAAAAAAAAAAAAAAAAAAAAAAA  
AAAA

Human SIAH1 Protein sequence - var1 (public gi: 27503514) (SEQ ID NO: 271)  
MTGKATPPSLYSWRGVLFCLPAARTRKRKEMSRQTATALPTGTSKCPPSQRVPALTGTTASNNDSL  
ECPVCFDYVLPPILQCQSGHLVCSNCRPKLTCCPTCRGPLGSIRNLAMEKVANSVLFPC  
PHTEKADHEELCEFRPYSCPCPGASCKWQGSLEAVMPHLMHQHKSITTLQGEDIVFL  
MMQSCFGFHFMLVLEKQEKYDGHQQFFAIVQLIGTRKQAENFAYRLELN  
GHRRLTWEATPRSIHEGIATAIMNSDCLVFDTSIAQLFAENGNLGINVTISMC  
MC

Human SIAH1 Protein sequence - var2 (public gi: 4506947) (SEQ ID NO: 272)  
MSRQTATALPTGTSKCPPSQRVPALTGTTASNNDSL  
ECPVCFDYVLPPILQCQSGHLVCSNCRPKLT  
CCPTCRGPLGSIRNLAMEKVANSVLFPC  
YASSGCEITLPHTEKADHEELCEFRPYSCPC  
PGASCKWQGSLEAVMPHLMHQHKSITTLQ  
GEDIVFLTDINLPGAVDWMMQSCFGFHFMLV  
LEKQEKYDGHQQFFAIVQLIGTRKQAENFAY  
RLELN  
GHRRLTWEATPRSIHEGIATAIMNSDCLV  
FDTSIAQLFAENGNLGINVTISMC  
MC

Unigene Name: SMN1 Unigene ID: Hs.288986 Clone ID: GD\_1114

Human SMN1 mRNA sequence - var1 (public gi: 624185) (SEQ ID NO: 142)  
CGGGCCCCACGCTGCCATCCGGGGTTGCTATGGCATGAGCAGCGGGCAGTGGTGGCGCGTCC  
CGGAGCAGGAGGATTCCGTGCTGTCGGCGGGCACAGGCCAGAGCGATGATTCTGACATTGGGATGA  
TACAGCACTGATAAAAAGCATATGATAAAGCTGTGGCTCATTAAGCATGCTCTAAAGAATGGTACATT  
TGTGAAACTTCGGTAAACAAAAACACACTAAAGAAAACCTGCTAAGAAGAATAAAAGCCAAAAGA  
AGAATACTGCAGCTCTTACAACAGTGGAAAGTGGGACAATGTTCTGCCATTGGTCAGAACAGG  
TTGCATTACCCAGCTACCATGCTTCAATTGATTAAAGAGAGAAACCTGTTGTTACACTGGA  
TATGAAATAGAGAGGAGCAAATCTGTCGATCTACTTTCCCAATCTGTGAAAGTAGCTAATAATATAG  
AACAGAATGCTCAAGAGAATGAAAGCCAAGTTCACAGATGAAAGTAGAGAACTCCAGGTCTCC  
TGGAAATAATCAGATAACATCAAGCCAAATCTGCTCCATGAACTCTTCTCCACCACCCCC  
ATGCCAGGGCCAAGACTGGGACCAGGAAAGCCAGGTCTAAATTCAATGGCCACCAACGGCCACCC  
CACCACCCACCTTACTATCATGCTGGCTGCCATTCTCTGGACCACCAATAATTCCCCCACC  
ACCTCCCATATGTCAGGATCTCTTGATGATGCTGATGTTGGAAAGTGTAAATTGTCATGGTACATG  
AGTGGCTATCATACTGGCTATTATATGGGTTTCAGACAAAATCAAAAGAAGGAAGGTGCTCACATTCT  
TAAATTAAAGGAAATGCTGGCATAGAGCAGCTAAATGACACCAATAAGAACGATCAGACAGATCT  
GGAATGTAAGCGTTATAGAAGATAACTGGCTCATTTCTCAAATATCAAGTGTGGAAAGAAAAAA  
GGAAGTGGATGGTAACTCTTCTGATTTAAAGGAAATGCAATGTGAAATATTTCACATTGTCATGGTACATG  
TGGACTCTTTGAAAAACCATCTGTAAGAAGACTGGGTTGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG  
TTGAGAAAATTGAAATGTGGATTAGATTTGAATGATATTGATAATTATTGTAATTGTCATGGTACAGAAT  
AGTGTCTTAAATGTTCAATGGTTAACAAAATGTATGTGAGGCGTATGTGGCAAATGTTACAGAAT  
CTAATGGTGGACATGGCTGTTCAATTGACTGTTTTCTATCTTCTATGTTAAAGTATATAATA  
AAAATTTAATTTTTTTA

Human SMN1 mRNA sequence - var2 (public gi: 15929773) (SEQ ID NO: 143)  
GGCCCCACGCTGCCACCCGGGGTTGCTATGGCATGAGCAGCGGGCAGTGGTGGCGGTCCCGG  
AGCAGGAGGATTCCGTGCTGTCGGCGGGCACAGGCCAGAGCGATGATTCTGACATTGGGATGATAC  
AGCACTGATAAAAGCATATGATAAAGCTGTGGCTCATTAAGCATGCTCTAAAGAATGGTACATTG  
GAAACCTCGGGAAACCAAAACACACTAAAGAAAACCTGCTAAGAAGAATAAAAGCCAAAAGAAGA  
ATACTGCAGCTCTTACAACAGTGGAAAGTGGGACAATGTTCTGCAATTGGTCAAGAGACGGTTG  
CATTACCCAGCTACATTGCTTCAATTGATTTAAAGAGAGAAACCTGTTGTTGTTACACTGGATAT  
GGAATAGAGAGGAGCAAATCTGTCGATCTACTTTCCCAATCTGTGAAAGTAGCTAATAATATAGAAC  
AGAATGCTCAAGAGAATGAAAGCCAAGTTCACAGATGAAAGTGAGAACTCCAGGTCTCCCTGG  
AAATAATCAGATAACATCAAGCCAAATCTGCTCATGGAACTCTTCTCCACCACCCCCCATG  
CCAGGGCCAAGACTGGGACCAAGGAAAGCCAGGTCTAAATTCAATGGCCACCAACGGCCACCGCACCAC  
CACCACCCACTTACTATCATGCTGGCTGCCATTCTCTGGACCACCAATAATTCCCCCACC  
TCCCATATGTCAGATTCTCTGATGATGCTGATGCTTGGAAAGTATGTAATTGTCATGGTACATGAGT  
GGCTATCATACTGGCTATTATATGGGTTTAGACAAAATCAAAAGAAGGAAGGTGCTCACATTCTTAA  
ATTAAGGAGAAATGCTGGCATAGAGCAGCACTAAAGAACGATCAGACAGATCTGGA  
ATGTGAAGCGTTAGAAGATAACTGGCTCATTTCTCAAAATATCAAGTGTGGAAAGAAAAAGGA  
AGTGGAAATGGGTAACTCTCTGATTTAAAGTTATGTAATAACCAATGCAATGTGAAATATTACTGG  
ACTCTATTGAAAACCATCTGTAAGAAGACTGGGTTGGGAGGGGGGGGGGGGGGGGGGGGGGGGGGG  
TGAGAAAATTGGAATGTGGATTAGATTTGAATGATATTGATAATTGTAATTGAGCTGTGA  
GAAGGGTGTGTAGTTAAAGACTGTCTTAAATTGCAACTTAAGCATTTAGGAATGAAGTGTAGA  
GTGTCTTAAATGTTCAATTGTTAACAAAATGTATGTGAGGCGTATGTGGCAAATGTTACAGAATC  
TAACTGGTGGACATGGCTGTTCAATTGACTGTTTTCTATCTTCTATGTTAAAGTATATAATA  
AAAATTTAATTTTTTAAAAAAAAAAAAAAAAAAAAAA

Human SMN1 mRNA sequence - var3 (public gi: 13259511) (SEQ ID NO: 144)  
CCACAAATGTGGAGGGCGATAACCACTCGTAGAAAGCGTGAGAAGTACTACAAGCGGTCTCCGGCC  
ACCGTACTGTTCCGCTCCAGAACGCCCGGGCGGAAAGTCGTCACTCTTAAGAAGGGACGGGGCCCCA  
CGCTGCGACCCCGGGGTTGCTATGGCATGAGCAGCGGGCAGTGGTGGCGGTCCCGGAGCAGGA  
GGATTCCGTGCTGTTCCGGCGGGCACAGGCCAGAGCGATGATTCTGACATTGGGATGATACAGCACTG  
ATAAAAGCATATGATAAAAGCTGTGGCTCATTTAAGCATGCTCTAAAGAATGGTACATTGTAACCTT  
CGGTAACCAAAACACACCTAAAGAAAACCTGCTAAGAAGAATAAAAGCCAAAAGAAGAATAACTG  
AGCTTCTTACACAGTGGAAAGTGGGACAATGTTCTGCCATTGGTCAGAAGAGACGGTTGCATTAC  
CCAGCTACCATGCTTCAATTGATTTAAGAGAGAAACCTGTTGTTACACTGGATATGAAATA  
GAGAGGAGCAAATCTGTCGATCTACTTCCCAATCTGTAAGTAGCTAATAATAGAACAGAACG  
GAGAGGAGCAAATCTGTCGATCTACTTCCCAATCTGTAAGTAGCTAATAATAGAACAGAACG

TCAAGAGAATGAAAATGAAAGCCAAGTTCAACAGATGAAAGT GAGA ACTCCAGGTCTCCTGGAAATAAA  
TCAGATAACATCAAGCCCCAAATCTGCTCATGGAACTCTTTCTCCCTCCACCACCCCCCATGCCAGGGC  
CAAGACTGGGACCAAGGAAAGATAATTCCCCCACCCACCTCCCATATGTCAGATTCTCTGATGATGCTGA  
TGCTTGGGAAGTATGTTAATTTCATGTCATGAGTGGCTATCATACTGGCTATTATATGGGTTTCAGA  
CAAATCAAAAAGAAGGAAGGTGCTCACATTCTAAATTAAAGGAGAAATGCTGGCATAGAGCAGCACTA  
AATGACACCACTAAAGAACGATCAGACAGATCTGGAATGTAAGCGTTATAGAAGATAACTGGCTCAT  
TTCTCAAAATATCAAGTGTGGAAAGAAAAAGGAAGTGGAACTCTTCTGATTAAGGAGAAATGCTTCTGAT  
ATGTAATAACCAATGCAATGTGAAATTTTACTGGACTCTTGAAACCATCTGTAAGACTGGG  
GTGGGGTGGGAGGCCAGCACGGTGGTGGAGGCACTGAGAAAATTGAAATGTTGATTAGTTGAATGA  
TATGGATAATTATGGTAATTATGGCTGTGAGAAGGGTGTGAGTTATAAAAGACTGTCTTAAT  
TTGCATACTTAAAGCATTAGGAATGAAAGTGTAGAGTGTCTTAAATGTTCAAATGTTAACAAAATG  
TATGTGAGGCGTATGTGGCAAAATGTTACAGAATCTAAGTGGGACATGGCTGTCTTAACTGT  
TTCTATCTTATATGTTAAAAGTATATAATAAAAATATTAAATTTCATTTTTTA

Human SMN1 mRNA sequence - var4 (public gi: 13111817) (SEQ ID NO: 145)  
GGGGCCCACCGCTGCGCACCGCGGGTTGCTATGGCGATGAGCAGCGCCAGTGGTGGCGCGTCCC  
GGAGCAGGAGGATTCCGTGCTTCCGGCGCGCACAGGCCAGAGCGATGATTCTGACATTGGGATGAT  
ACAGCACTGATAAAAGCATATGATAAAAGCTGTGGCTCATTAAGCATGCTCAAAGAATGGTACATTT  
GTGAAACTCGGGTAAACCAAAACACACCTAAAGAAAACCTGCTAACAGAAGATAAAAGCCAAAAGAA  
GAATACTGCAGCTCCCTAACACAGTGGAAAGTGGGACAATGTTCTGCCTATTGGTCAGAACAGGT  
TGCATTACCCAGCTTACATTGCTCAATTGATTAAAGAGAGAAACCTGTTGTTACACTGGAT  
ATGGAATAGAGAGGAGCAAAATCTGTCGATCTACTTCCCCAATCTGTAAGTAGCTAATAATAGA  
ACAGAATGCTCAAGAGAATGAAAAGCCAAGTTCAACAGATGAAAAGT GAGA ACTCCAGGTCTCCT  
GGAAATAAAATCAGATAACATCAAGCCCCAAATCTGCTCATGGAACTCTTTCTCCCTCCACCACCCCC  
TGCCAGGGCCAAGACTGGGACCAAGGCCAGGTCTAAAATCAATGGCCCACCACGCCACGCCACC  
ACCACCAACCCACTTACTATCATGCTGGCTGCCATTCTCTGGACCACCAATAATTCCCCC  
CCTCCATATGTCAGATTCTTGTGATGCTGATGCTTTGGAAAGTATGTTAATTGATGGTACATGA  
GTGGCTATCATGGCTATTATGAAATGCTGGCATAGAGCAGCACTAAATGACACCCTAAAGAAA  
CGATCAGACAGATCTGAAAGTGAAGCGTTAGAAGATAACTGGCCTCATTCCTCAAATAATCAAGTG  
TTGGGAAAGAAAAAGGAAGTGGAAATGGTAACTCTTCTGATTAAAGGTTATGTAATAACCAAAATGCAA  
TGTGAAATATTTACTGGACTCTATTGAAAACCATCTGTAAGAGACTGAGGTGGGGTGGGAGGCCA  
GCACGGTGGTGGAGGCAGTTGAGAAAATTGAAATGTTGATTAGATTGAAATGATATTGGATAATTATTGG  
TAATTGAGCTGTGAGAAGGGTGTGAGTTATAAAAGACTGTCTTAAATTGCAACTTAAGCATT  
TAGGAATGAAAGTGTAGAGTGTCTTAAATGGTTAACAAAATGTTAGTGTGAGGCGTATGTG  
GCAAAATGTTACAGAATCTAAGTGGGACATGGCTGTCTTGTACTGTTTTCTATCTTATATG  
TTAAAAGTATATAATAAAAATATTAAATTTCATTTTTTAA

Human SMN1 mRNA sequence - var5 (public gi: 13259515) (SEQ ID NO: 146)  
CCACAAATGTGGAGGGCGATAACCAACTCGTAGAAAGCGT GAGAAGT TACTACAAGCGGTCTCCCGGCC  
ACCGTACTGTTCCGCTCCAGAACGCCGGCGGAGTCGTCACTCTTAAAGAAGGGACGGGGCCCCA  
CGCTCGCACCCCGGGTTGCTATGGCGATGAGCAGCGCCAGTGGTGGCGCTCCGGAGCAGGA  
GGATCCGTGCTGTTCCGGCGGGCACAGGCCAGAGCGATGATTCTGACATTGGGATGATAACAGCACTG  
ATAAAAGCATATGATAAAAGCTGTGGCTTCATTAAAGCATGCTCTAAAGAATGGTACATTGTGAAACTT  
CGGGTAAACCAAAACACACCTAAAGAAAACCTGCTAACAGAAGATAAAAGCCAAAAGAAGAAACTGC  
AGCTCCTTACACAGTGGAAAGTGGGACAAATGTTCTGCCATTGGTCAGAACAGCGTTGCTATTAC  
CCAGCTACCATGCTTCATTGATTAAGAGAGAAACCTGTTGTTGTTACACTGGATATGAAATA  
GAGAGGAGCAAATCTGTCGATCTACTTCCCCAATCTGTAAGTAGCTAATAATAGAACAGAATGC  
TCAAGAGAATGAAAATGAAAGCCAAGTTCAACAGATGAAAAGT GAGA ACTCCAGGTCTCTGGAAATAAA  
TCAGATAACATCAAGCCCCAAATCTGCTCATGGAACTCTTTCTCCCTCACCACCCCCCATGCCAGGGC  
CAAGACTGGGACCCAGGAAAGCCAGGTCTAAAATTCAATGGGCCACCACGCCACCCACACCC  
CCACTTACTATCATGCTGGCTGCCATTCTCTGGACCACCAATAATTCCCCCACCACCTCCCTA  
TGTCAGATTCTCTTGATGATGCTGATGCTTTGGAAAGTATGTTAATTGATGGTACATGAGTGGCTATC  
ATACTGGCTATTATATGGTTTCAAGACAAAATCAAAAGAAGGAAGGTGCTCACATTCTTAAATTAAGG  
AGAAATGCTGGCATAGAGCAGCACTAAATGACACCCTAAAGAAACGATCAGACAGATCTGGAATGTGAA  
GGCTTATAGAAGATAACTGGCCTCATTTCTCAAAATATCAAGTGTGGAAAGAAAAAGGAAGTGGAA  
TGGGTAACCTCTCTGATTAAGGTTATGTAATAACCAATGCAATGTGAAATATTACTGGACTCTT  
TGAAAACCATCTGTAAGACTGGGGTGGGGTGGGAGGCCAGCACGGTGGTGGAGGCACTGAGAAAAT  
TTGAATGTTGAGATTGAAATGATATTGATAATTGTTAATTGTTAATTGCTGAGAGTGTGAGGAG  
TGTAGTTATAAAAGACTGTCTTAAATTGCAACTTAAGCATTAGGAATGAAAGTGTAGAGTGTCTTAA  
AATGTTCAAAATGGTTAACAAAATGTTAGTGTGAGGCGTATGTGGCAAAATGTTACAGAATCTAAGTGG  
GACATGGCTGTCTTGTACTGTTTTCTATCTTATGTTAAAAGTATATAATAAAAATATTAA  
ATTTCATTTTTA

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Human SMN1 Protein sequence - var1 (public gi: 13259512) (SEQ ID NO: 273)  
MAMSSGGGGVPEQEDSVLFRRTGQSDDSDIWDDTALIKAYDKAVASFHKHALKNNDICETSGKPKTTP  
KRKPAKKNKSQQKNTAASLQQWKVGDKCSAIWSEDCIYPATIASIDFKRETCVVVTGYGNREEQNLSD  
LLSPICEVANNIEQNAQENENESQVSTDESENSRSPGNKSDNIKPKSAPWNSFLPPPPMPGPRLGPCKI  
IPPPPICPDSDLDDADALGSM LISWYMSGYHTGYMGFRQNKEGRCSHSLN

Human SMN1 Protein sequence - var2 (public gi: 12654181) (SEQ ID NO: 274)  
MAMSSGGGGVPEQEDSVLFRRTGQSDDSDIWDDTALIKAYDKAVASFHKHALKNNDICETSGKPKTTP  
KRKPAKKNKSQQKNTAASLQQWKVGDKCSAIWSEDCIYPATIASIDFKRETCVVVTGYGNREEQNLSD  
LLSPICEVANNIEQNAQENENESQVSTDESENSRSPGNKSDNIKPKSAPWNSFLPPPPMPGPRLGPCKP  
GLKFNGPPPPPPPPPHLLSCWLPPFSGPPIIPPPPICPDSDLDDADALGSM LISWYMSGYHTGYYMEM  
LA

Human SMN1 Protein sequence - var3 (public gi: 4507091) (SEQ ID NO: 275)  
MAMSSGGGGVPEQEDSVLFRRTGQSDDSDIWDDTALIKAYDKAVASFHKHALKNNDICETSGKPKTTP  
KRKPAKKNKSQQKNTAASLQQWKVGDKCSAIWSEDCIYPATIASIDFKRETCVVVTGYGNREEQNLSD  
LLSPICEVANNIEQNAQENENESQVSTDESENSRSPGNKSDNIKPKSAPWNSFLPPPPMPGPRLGPCKP  
GLKFNGPPPPPPPPPHLLSCWLPPFSGPPIIPPPPICPDSDLDDADALGSM LISWYMSGYHTGYYMGF  
RQNKEGRCSHSLN

Human SMN2 mRNA sequence - var1 (public gi: 736410) (SEQ ID NO: 147)  
GCGATGAGCAGCGCGGCAGTGGTGGCGTCCCGGAGCAGGAGGATTCCGTCTTCCGGCGCGCA  
CAGGCCAGAGCGATGATTCTGACATTGGGATGATAACAGCACTGATAAAAGCATATGATAAAAGCTGTGGC  
TTCATTTAACGATGCTCTAAAGAACGTTGACATTGGTAAACTTCGGTAAACCTTCCTTACACAGTGGAAAGTTG  
AGAAAACCTGCTAACGAAAGAACGAAAGAACGAAAGAACGAAACTCTGCACTTCCCTTACACAGTGGAAAGTTG  
GGGACAATGTTCTGCCATTGGTCAAGAGACGGTTGCATTACCCAGCTACCAATTGCTTCAATTGATTT  
TAAGAGAGAACCTGTGTAAGTAGCTAAATAATAGAACAGAACGAGAACGAAATCTGTCGATCTA  
CTTCCCCAATCTGTAAGTAGCTAAATAATAGAACAGAACGAGAACGAAATCTGTCGATCTA  
TTCAACAGATGAAAGTGAAGACTCCAGGTCTCTGGAAATAATCAGATAACATCAAGCCAAATCTGC  
TCCATGGAACCTTTCTCCCTCACCCCCCATGCCAGGGCAAGACTGGGACAGGAAGCCAGGT  
CTAAAATTCAATGGCCCACCACGCCACCGCCACCCACCCACTTACTATCATGCTGGCTGCCTC  
CATTTCTCTGGACCACCAATAATTCCCCCACCCATATGTCAGATTCTTGATGATGCTGA  
TGCTTGGGAAGTATGTTATTCTATGGTACATGAGTGGTATCATACTGGTATTATATGGGTTT  
CAAATCAAAAGAAGGAAGGTGCTCACATTCTTAAATTAAAGGAGAAATGCTGGCATAGAGCAGCACTA  
AATGACACCCTAAAGAACGATCAGACAGATCTGGAAATGTAAGCGTATAGAACATACTGGCCTCAT  
TTCTCAAAATATCAAGTGGGGAAAGAAAAAGGAAGTGGAAATGGTAACTCTTCTGATTAAAAGTT  
ATGTAATAAACCAATGCAATGTAAGTGGAAATTTACTGGACTCTATTGAAACCATCTGAAAGACTG  
AGGTGGGGTGGGGACCGCCACCGTGTGAGGAGTTGAGAAAGGTGTTGAGTTATAAAAGACTGCTTA  
GATATGGATAATTATTGTAATTGAGCTGTGAGAAGGGTGTGAGTTATAAAAGACTGCTTA  
ATTGCACTAAAGCATTAGAACGAGTGTAGAGTGTCTTAAATGTTCAATGGTTAACAAA  
TGTATGTGAGCGTATGGCAAAATGTTACAGAACATCTAACCTGGTGGACATGGCTGTTATTGACTGTT  
TTTTCTATCTCTATATGTTAAAGTATATAATAAAATATTTAATTTTTTTAAACAAAAAA

Human SMN2 mRNA sequence - var2 (public gi: 13259530) (SEQ ID NO: 148)  
CCACAAATGGGGAGGGCGATAACCACCTCGTAGAAAGCGTGAGAACGTTACTACAAGCGGTCTCCGGCC  
ACCGTACTGTTCCGCTCCAGAACGCCCGGCGCGGAAGTCGTCACTCTTAAGAACGGACGGGGCCCA  
CGCTGCGCACCGCGGGTTGCTATGGCGATGAGCAGCGCGCAGTGGTGGCGGTCCGGAGCAGGA  
GGATTCCGTGCTTCCGGCGCGCACAGGCCAGAGCGATGATTCTGACATTGGGATGATAACGCACTG  
ATAAAAGCATATGATAAAAGCTGTGGCTCATTTAACGATGCTCTAAAGAACGTTGACATTGTAACCTT  
CGGGTAAACCAAAACACACCTAAAGAACCTGCTAACGAAAGAACGAAACTCTG  
AGCTTCTTACAACAGTGGAAAGTTGGGACAATGTTCTGCCATTGGTCAAGAGACGGTGTGCAATTAC  
CCAGCTACCAATTGCTTCAATTGATTAAAGAGAACCTGTGTTGTTTACACTGGATATGGAAATA  
GAGAGGAGCAAATCTGTCGATCTACTTCCCAATCTGTAAGTAGCTAAATAATAGAACAGAACATGC  
TCAAGAGAACGAAAGCCAAGTTCAACAGATGAAAGTGGAGAACCTCCAGGTCTCTGGAAATAAA  
TCAGATAAACATCAAGCCCCAAATCTGCTTACAAGAACGTTGAGAACGTTGAGAACGTTGAGAACG  
CAAGACTGGGACCGAGAACGATAATTCCCCCACCCATGTCAGATTCTTGTGATGATGCTGA  
TGCTTGGGAAGTATGTTATTGTCATGGTACATGAGTGGTATCTACACTGGCTATTATATGGAAATGCTG  
GCATAGAGCAGCACTAAATGACACCAACTAAAGAACGATCAGACAGAACGATCTGGAAATGTAAGC  
AGATAACTGGCCTCATTCTTCAAAATATCAAGTGGTGGAAAGAAAAAGGAAGTGGAAATGGTAAC  
TTCTGATTAAAAGTTATGTAATAACCAAATGCAATGTGAAATTTACTGGACTCTTTGAAACCA

Figure 36 part - 82

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TCTGTAAAAGACTGAGGTGGGGTGGGAGGCCAGCACGGTGGTAGGCAGTTGAGAAAATTGAATGTGG  
ATTAGATTTGAATGATAATTGGATAATTATTGGTAATTATGGCCTGTGAGAAGGGTGTGAGTTAT  
AAAAGACTGTCTAATTGCATACTTAAGCATTTAGGAATGAAGTGTAGAGTGTCTAAATGTTCAA  
ATGGTTAACAAAATGTATGTAGGGCGTATGTGGCAAAATGTACAGAATCTAAGTGGGACATGGCTG  
TTCATTGTACTGTTTTCTATCTTCTATATGTTAACAGTATATAATAAAAATTAAATTAAAAA  
AAA

Human SMN2 mRNA sequence - var3 (public gi: 13259528) (SEQ ID NO: 149)  
CCACAAATGTGGGAGGGCGATAACCACCTCGTAGAAAGCGTGAGAAGTTACTACAAGCGGTCTCCGGCC  
ACCGTACTGTTCCGCTCCCAGAACGCCCCGGCGGAAGTCGTCACTCTTAAGAAGGGACGGGGCC  
CGCTGCGACCCCGGGTTGCTATGGCAGTGAGCAGCGGGCAGTGGTGGCGGTCCGGAGCAGGA  
GGATTCCTGCTGTTCCGGCGGCACAGGCCAGAGCGATGATTCTGACATTGGATGATACTGGCT  
ATAAAAGCATATGATAAAAGCTGTGGCTCATTTAACAGATGCTAAAGAATGGTACATTGTGAAACTT  
CGGGTAAACAAAACACACCTAAAGAAAACCTGCTAAAGAAGAATAAAAGCCAAAAGAAGAATACTGC  
AGCTTCTTACAACAGTGGAAAGTGGGACAAATGTTCTGCATTGGCTCAGAGCGTTGCAATT  
CCAGCTACCATGCTTCATTGATTTAACAGAGAAAACCTGTTGTTGTTACACTGGATATGAAATA  
GAGAGGAGCAAATCTGTCGATCTACTTCCCAATCTGTGAAAGTAGCTAATAATAGAACAGAATGC  
TCAAGAGAATGAAAGCCAAGTTCAACAGATGAAAGTGAGAACCTCCAGGTCTCTGGAAATAAA  
TCAGATAACATCAAGCCAAATCTGCTCCATGGAACCTCTTCTCCCTCACCACCCCCATGCCAGGGC  
CAAGACTGGGACCAGGAAAGATAATTCCCCCACCACCTCCATATGTCAGATTCTCTGATGATGCTGA  
TGCTTGGGAAAGTATGTTAATTTCATGGTACATGAGTGGCTATCATACTGGCTATTATATGGGTT  
GAGAGGAGCAAATCTGTCGATCTACTTCCCAATCTGTGAAAGTAGCTAATAATAGAACAGAATGC  
CAAATCAAAAAGAAGGAAGGTGCTCACATTCTTAAATTAAAGGAGAAATGCTGGCATAGAGCAGCA  
AATGACACCACTAAAGAACGATCAGACAGATCTGGATGTGAAAGCGTTAGAGAAGATAACTGGC  
TTCTTCTTAAATCAAGTGTGGGAAAGGAAAGTGGAAATGGGTAACCTCTTCTGATTAAAAGTT  
ATGTAATAACCAAATGCAATGTGAAATATTACTGGACTCTTCTGAAAACCATCTGTAAAAGACTGAG  
GTGGGGTGGGAGGCCAGCAGGGTGGAGGAGAAATTGAAATGTGGATTAGATTGAAATG  
TATTGGATAATTGGTAAATTGGCTGTGAGAAGGGTGTGAGTTATAAAAGACTGTCTTAAT  
TTGCATACTTAAGCATTAGGAATGAAGTGTAGAGTGTCTAAATGTTCAAATGGTTAACAAAATG  
TATGTGAGGCAGTGTGGCAAAATGTACAGAATCTAAGTGGGACATGGCTGTTCAATTGACTGTTT  
TTCTATCTTCTATATGTTAACAGTATATAATAAAAATTAAATTAAAAAATTAAATTTTTTTAA

Human SMN2 mRNA sequence - var4 (public gi: 13259526) (SEQ ID NO: 150)  
CCACAAATGTGGGAGGGCGATAACCACCTCGTAGAAAGCGTGAGAAGTTACTACAAGCGGTCTCCGGCC  
ACCGTACTGTTCCGCTCCCAGAACGCCCCGGCGGAAGTCGTCACTCTTAAGAAGGGACGGGGCC  
CGCTGCGACCCCGGGTTGCTATGGCAGTGAGCAGCGGGCAGTGGTGGCGGTCCGGAGCAGGA  
GGATTCCTGCTGTTCCGGCGGCACAGGCCAGAGCGATGATTCTGACATTGGATGATACTGGCT  
ATAAAAGCATATGATAAAAGCTGTGGCTCATTTAACAGATGCTCTAAAGAATGGTACATTGTGAAACTT  
CGGGTAAACAAAACACACCTAAAGAAAACCTGCTAAAGAAGAATAAAAGCCAAAAGAAGAATACTGC  
AGCTTCTTACAACAGTGGAAAGTGGGACAAATGTTCTGCATTGGCTCAGAGACGGTTGCAATT  
CCAGCTACCATGCTTCATTGATTTAACAGAGAAAACCTGTTGTTGTTTACACTGGATATGAAATA  
GAGAGGAGCAAATCTGTCGATCTACTTCCCAATCTGTGAAAGTAGCTAATAATAGAACAGAATGC  
TCAAGAGAATGAAAAGCCAAGTTCAACAGATGAAAGTAGCTAATAATAGAACAGAATG  
TCAGATAACATCAAGCCAAATCTGCTCCATGGAACCTCTTCTCCCTCACCACCCCCATGCCAGGGC  
CAAGACTGGGACCAGGAAAGCCAGGTCTAAATTCAATGGCCCAACCACGCCACGCCACCA  
CCACTTACTATCATGCTGGCTGCCCTCATTCTCTGGACCACCAATAATTCCCCCACCACCTCCATA  
TGTCCAGATTCTCTGATGATGCTGTTGGAGTATGTTAATTTCATGGTACATGAGTGGCTATC  
ATACTGGCTATTATATGGAAATGCTGGCATAGAGCAGCACTAAATGACACCCTAAAGAAAAGATCAGAC  
AGATCTGGAATGTGAGCGTTAGAGAAGATAACTGGCTCATTTCTTAAATATCAAGTGTGGGAAAG  
AAAAAGGAAGTGGAAATGGTAACTCTTCTGATTTAAAGTATGTAATAACCAAATGCAATGTGAAATA  
TTTACTGGACTCTTTGAAAACCATCTGTAAAAGACTGAGGTGGGGTGGGAGGCCAGCAGGTGGTG  
AGGCAAGTGTGAGAAAATTGAAATGTGGATTAGATTGTTGAAATGATATTGAAATTATGGTAATT  
CCTGTGAGAAGGGTGTGAGTTATAAAAGACTGTCTTAAATTGCAACTTAAGCATTAGGAATGAAG  
TGTAGAGTGTCTTAAATGTTCAACAAAATGTATGTGAGGGCGTATGTGGCAAAATGTTA  
CAGAATCTAAGTGGGACATGGCTGTTCAATTGACTGTTTTCTATCTTCTATATGTTAAAAGTAT  
ATAATAAAAATTAAATTAAAAATTAAATTTTTTTAA

Human SMN2 mRNA sequence - var5 (public gi: 13259525) (SEQ ID NO: 151)  
CCACAAATGTGGGAGGGCGATAACCACCTCGTAGAAAGCGTGAGAAGTTACTACAAGCGGTCTCCGGCC  
ACCGTACTGTTCCGCTCCCAGAACGCCCCGGCGGAAGTCGTCACTCTTAAGAAGGGACGGGGCC  
CGCTGCGACCCCGGGTTGCTATGGCAGTGAGCAGCGGGCAGTGGTGGCGGTCCGGAGCAGGA  
GGATTCCTGCTGTTCCGGCGGCACAGGCCAGAGCGATGATTCTGACATTGGATGATACTGGCT  
ATAAAAGCATATGATAAAAGCTGTGGCTCATTTAACAGATGCTAAAGAATGGTACATTGTGAAACTT

CGGGTAAACCAAAAACCACACTAAAAGAAAACCTGCTAAGAAGAATAAGCCAAAAGAAGAATACTGC  
AGCTTCTTACAACAGTGGAAAGTTGGGACAAATGTTCTGCATTGGTCAGAAGACGGTTGCATTAC  
CCAGCTACCATGGCTCAATTGATTTAAGAGAGAACCTGTGTTGGTTACACTGGATATGGAAATA  
GAGAGGAGCAAATCTGCCATCTACTTTCCCCAATCTGTGAAGTAGCTAATAATAGAACAGAATGC  
TCAAGAGAATGAAAATGAAAGCCAAGTTCAACAGATGAAAGTGAGAACTCCAGGTCTCTGGAAATAAA  
TCAGATAACATCAAGCCCAAATCTGCCATGGAACTCTTCTCCCTCCACCCCCCATGCCAGGGC  
CAAGACTGGGACAGGAAAGCCAGGTCTAAAATTCAATGGCCACCACGCCACGCCACCACCCACC  
CCACTTACTATCATGCTGGCTGCCATTCTCTGGACCCAATAATTCCCCCACCACCTCCATA  
TGTCAGATTCTTGTGATGCTGATGCTGGAAAGTATGTTAATTCTATGGTACATGAGTGGTATC  
ATACTGGCTATTATGGTTTAGACAAAATCAAAAAGAAGGAAGGTGTCACATTCTTAAATTAAAGG  
AGAAATGCTGGCATAGAGCAGCACTAAATGACACCACTAAAGAAACGATCAGACAGATCTGGAATGTGAA  
CGGTATAGAAGATAACTGGCCTATTCTCAAAATATCAAGTGTGGGAAAGAAAAAGGAAGTGGAA  
TGGGTAACTCTCTGATTAAAAGTTATGTAATAACCAATGCAATGTGAAATATTACTGGACTCTT  
TGAAAACCATCTGAAAAGACTGAGGTGGGGTGGGAGGCCAGCACGGTGGTGAGGAGAAAAT  
TTGAATGTGGATTAGATTTGAATGATATTGGATAATTATTGTAATTATGGCTGTGAGAAGGGTGT  
TGTAGTTATAAAAAGACTGCTTAATTGCTACTTAAGCATTAGGAATGAAGTGTAGAGTGTCTAA  
AATGTTCAAATGGTTAACAAAATGTATGTGAGGCGTATGTCGAAATGTTACAGAATCTAATGGTG  
GACATGGCTGTTATTGACTGTTTCTATGTTAAAAGTATATAATAAAAATATTAA  
ATTTTTTTAA

Human SMN2 Protein sequence - var1 (public gi: 736411) (SEQ ID NO: 276)  
AMSSGGGGVPEQEDSVLFRRGTGQSDDSDIWDDTALIKAYDKAVASFHKHALKNGDICETSGKPKTTPK  
RKPAKKNKSQKKNTAASLQQWKVGDKCSAIWSEDGCIYPATIASIDFKRETCAVVYVTGYGNREEQNLSDL  
LLSPICEVANNIEQNAQENENESQVSTDESENSRSPGNKSDNIKPKSAPWNSFLPPPPMPGPRLGPGKPG  
LKFNNGPPPPPPPPPHLLSCWLPPFSGPPIIPPPPICPDSLDDADALGSMLISWYMSGYHTGYYMGR  
QNQKEGRCSHSLN

Human SMN2 Protein sequence - var2 (public gi: 13259531) (SEQ ID NO: 277)  
MAMSSGGGGVPEQEDSVLFRRGTGQSDDSDIWDDTALIKAYDKAVASFHKHALKNGDICETSGKPKTTP  
KRPAKKNKSQKKNTAASLQQWKVGDKCSAIWSEDGCIYPATIASIDFKRETCAVVYVTGYGNREEQNLSD  
LLSPICEVANNIEQNAQENENESQVSTDESENSRSPGNKSDNIKPKSAPWNSFLPPPPMPGPRLGPGKI  
IPPPPPIPDSLDDADALGSMLISWYMSGYHTGYYMEMLA

Human SMN2 Protein sequence - var3 (public gi: 13259529) (SEQ ID NO: 278)  
MAMSSGGGGVPEQEDSVLFRRGTGQSDDSDIWDDTALIKAYDKAVASFHKHALKNGDICETSGKPKTTP  
KRPAKKNKSQKKNTAASLQQWKVGDKCSAIWSEDGCIYPATIASIDFKRETCAVVYVTGYGNREEQNLSD  
LLSPICEVANNIEQNAQENENESQVSTDESENSRSPGNKSDNIKPKSAPWNSFLPPPPMPGPRLGPGKI  
IPPPPPIPDSLDDADALGSMLISWYMSGYHTGYYMEMLA

Human SMN2 Protein sequence - var4 (public gi: 13259527) (SEQ ID NO: 279)  
MAMSSGGGGVPEQEDSVLFRRGTGQSDDSDIWDDTALIKAYDKAVASFHKHALKNGDICETSGKPKTTP  
KRPAKKNKSQKKNTAASLQQWKVGDKCSAIWSEDGCIYPATIASIDFKRETCAVVYVTGYGNREEQNLSD  
LLSPICEVANNIEQNAQENENESQVSTDESENSRSPGNKSDNIKPKSAPWNSFLPPPPMPGPRLGPGKPM  
GLKFNGPPPPPPPPPHLLSCWLPPFSGPPIIPPPPIPDSLDDADALGSMLISWYMSGYHTGYYMEM  
LA

Human SMN2 Protein sequence - var5 (public gi: 10937869) (SEQ ID NO: 280)  
MAMSSGGGGVPEQEDSVLFRRGTGQSDDSDIWDDTALIKAYDKAVASFHKHALKNGDICETSGKPKTTP  
KRPAKKNKSQKKNTAASLQQWKVGDKCSAIWSEDGCIYPATIASIDFKRETCAVVYVTGYGNREEQNLSD  
LLSPICEVANNIEQNAQENENESQVSTDESENSRSPGNKSDNIKPKSAPWNSFLPPPPMPGPRLGPGKPM  
GLKFNGPPPPPPPPPHLLSCWLPPFSGPPIIPPPPIPDSLDDADALGSMLISWYMSGYHTGYYMGF  
RQNQKEGRCSHSLN

Unigene Name: SNX1 Unigene ID: Hs.498154

Human SNX1 mRNA sequence - var1 (public gi: 3152939) (SEQ ID NO: 152)  
ATGGCGTCGGGTGGTGGCTGTAGCGCTCGGAGAGACTGCCTCCGCCCTCCCCGGCTGGAGCCGG  
AGTCCGAGGGGGCGGCCGGGGATCAGAACCGAGGGCTGGGACAGCGACACCGAGGGGGAGGACATT  
CACCGGCGCCGCGGTGGTCAGTAAACATCAGTCTCCAAAGATAACTACATCCCTCTCCATCAACAAT

GGCTCAAAGAAAATGGGATCCATGAAGAACAGACCAAGAGGCCACAGGATCTTTCAGATGCCACAG  
TGGAGCTATCCTGGACAGCACACAAAATAATCAGAAGAAGGTGCTAGCCAAACACTCAATTCTCTTC  
TCCTCAGGAAGCCACAAATTCTCGAAGCCCCAGCCAACCTATGAGGAGCTAGAGGAAGAACAGGAG  
GATCAATTGATTGACAGTCGGTATAACTGATCCTGAGAAGATAGGGATGGTATGAATGCATATGTAG  
CCTACAAAGTTACAACACAGACAAGCTTACCATGTTAGAAGCAAACAGTTGCAGTAAAAGAAGATT  
TAGTACTTCTGGTCTTATGAGAAGCTTCCAGAGAAGCACTCTCAGAATGGCTTCAATTGCTCTCCA  
TCCCCGGAGAAGAGCCTCATAGGGATGACAAAAGTGAAGTGGGAAGGAAGATTCTTCTGCAGAAT  
TTCTGAAAACGGAGGGCCCTTAAAGGTAACCTCAGAGGATTGTAATCATCCTACCATGTTACA  
GGACCTGACGTAGAGAGCTTCTGGAAAAAGAAGAGCTGCCACGTGGTACCCAGACATTGAGT  
GGTGGTGGTCTCTCAAGATGTTCAACAAAGGCCACAGATGCCAGCAGCAAATGACCATAAGATGAATG  
AATCAGACATTGGTTGAGGAGAAGCTCCAGGAGGTAGAGTGTAGGGAGCAGCGCTACGGAAACTGCA  
TGCTGTTGAGAAACTCTAGTCACCATAGGAAAGAGCTAGCGCTGAACACAGCCCAGTTGCAAAGAGT  
CTAGCCATGCTGGGAGCTGAGGACACACGGCATTGTCAGGGCACTCTCCAGCTGGTGGAGGTGG  
AAGAAAAATTGAGCAGCTCCACCAGGAACAGGCCAACAAATGACTTCTCCTCTGAGCTCTGAG  
TGACTACATTGCCCTGCCATAGTCAGCGCTGCCCTCGACCAGCGCATGAAGACATGGCAGCGCTGG  
CAGGATGCCAACGCCACTGAGAAGAGCGGGAGGCCAGGCTCGCTGTGGCAACAGCCTG  
ATAAGCTGCAGCAGGCCAACAGGAGATCCTCGAGTGGAGTCTCGGGTCACTCAATATGAAAGGGACTT  
CGAGAGGATTTCACACAGTGGTCCGAAAAGAAGTGAACGGTTGAGAAAGAGAAATCCAAGGACTTCAAG  
AACACGTGATCAAGTACCTTGAGACACTCCTTACTCACAGCAGCAGCTGGCAAAGTACTGGGAAGCCT  
TCCTCCTGAGGCCAACAGGCCATCTCCTAA

Human SNX1 mRNA sequence - var2 (public gi: 3152941) (SEQ ID NO: 153)  
ATGGCGTCGGGTGGTGGCTGTAGCGCTTCCGAGAGACTGCCCTCCGCCCTGGAGCCGG  
AGTCGGAGGGGGCGGGGGGATCAGAACCCAGGCTGGGAGCAGCGACACCGAGGGGGAGGACATT  
CACCGGCGCCGGTGGTCACTGAAACATCAGTCTCAAAGATAACTACATCCCTCTCCATCAACAAAT  
GGCTCAAAGAAAATGGGATCCATGAAGAACAGACCAAGAGGCCACAGGATCTTGCAGGGATGGTA  
TGAATGCATATGTTAGCCTACAAGTTACAACACAGACAAGCTTACCATGTTAGAAGCAAACAGTTGC  
AGTAAAAAGAAGATTAGTGAATTCTGGGTCTTATGAGAAGCTTCCGAGAAGCACTCTCAGAATGGC  
TTCATGTCCTCCATCCCCGGAGAAGAGCCTCATAGGGATGACAAAAGTGAAGTGGGAAGGAAGATT  
CTTCTCTGAGAATTCTGAAAAACGGAGGGCCCTTAGAAAGGTAACCTCAGAGGATTGTAATCA  
TCCCTACATGTTACAGGACCTGACGTAGAGGTTCTGGAAAAAGAAGAGCTGCCACGTGGCTGGGT  
ACCCAGACATTGAGTGGTCTGGTCTCTCAAGATGTTCAACAAAGGCCACAGATGCCAGCAGCAAATGA  
CCATCAAGATGAATGAATCAGACATTGGTTGAGGAGAAGCTCCAGGGTAGAGTGTGAGGGAGCAGCG  
CTTACGGAAACTGCATGCTGTTGAGAAACTCTAGTCACCATAGGAAAGAGCTAGCGCTGAACACAGCC  
CAGTTGCAAAGAGTCTAGCATGCTTGGAGCTGAGGACACACGGCATTGTCAGGGCACTCTCCC  
AGCTGGCTGAGGTTGAGAAAATTGAGCAGCTCCACAGGAAACAGGCCAACAAATGACTTCTCCT  
TGCTGAGCTCTGAGTGAACATTCGGCTCTGGCCATAGTCAGCGCTGCCCTCGACCAGCGCATGAAG  
ACATGGCAGCGCTGGCAGGATGCCAACACTGAGAAGAGCGGGAGGCCAGGCTGGCTGCTGT  
GGGCCAACAGGCTGATAAGCTGAGGCAAGGAGATCCTCGAGTGGAGTCTGGGTGACTCA  
ATATGAAAGGACTTCGAGAGGATTCAACAGTGGTCCGAAAAGAAGTGAACGGTTGAGAAAGAGAAA  
TCCAAGGACTCAAGAACACAGTGAACAGTACCTTGAGACACTCCTTACTCACAGCAGCAGCTGGCAA  
AGTACTGGGAAGCCTCCTCTGAGGCCAACAGGCCATCTCCTAA

Human SNX1 mRNA sequence - var3 (public gi: 30582804) (SEQ ID NO: 154)  
ATGGCGTCGGGTGGTGGCTGTAGCGCTTCCGAGAGACTGCCCTCCGCCCTGGAGCCGG  
AGTCGGAGGGGGCGGGCGGGGGATCAGAACCCAGGCTGGGAGCAGCGACACCGAGGGGGAGGACATT  
CACCGGCGCCGGTGGTCACTGAAACATCAGTCTCAAAGATAACTACATCCCTCTCCATCAACAAAT  
GGCTCAAAGAAAATGGGATCCATGAAGAACAGACCAAGAGGCCACAGGATCTTGCAGATGCCACAG  
TGGAGCTATCCTGGACAGCACACAAAATAATCAGAAGAAGGTGCTAGCAGCAAACACTCAATTCTCTCC  
TCCTCAGGAAGCCACAAATTCTCGAAGCCCCAGCCAACCTATGAGGAGCTAGAGGAAGAACAGGAG  
GATCAATTGATTGACAGTCGGTAAACTGATCCTGAGAAGATAGGGATGGTATGAATGCATATGTAG  
CCTACAAAGTTACAACACAGACAAGCTTACCATGTTAGAAGCAAACAGTTGCAGTAAAAGAAGATT  
TAGTGAATTCTGGGTCTTATGAGAAGCTTCCGAGAAGGACTCTCAGAAGATGGCTTCAATTGCTCTCCA  
CCCCGGAGAAGAGCCTCATAGGGATGACAAAAGTGAAGTGGGAAGGAAGATTCTTCTGCAGAAT  
TTCTTGGAAAACGGAGGGCCCTTAGAAAGGTAACCTCAGAGGATTGTAATCATCCTACCATGTTACA  
GGACCTGACGTAGAGAGTTCTGGAAAAAGAAGAGCTGCCACGTGGCTGGTACCCAGACATTGAGT  
GGTGGCTGGTCTCTCAAGATGTTCAACAAAGGCCACAGATGCCAGCAGCAAATGACCATCAAGATGAATG  
AATCAGACATTGGTTGAGGAGAAGCTCCAGGGAGTAGAGTGTGAGGGAGCAGCGCTACGGAAACTGCA  
TGCTGTTGAGAAACTCTAGTCACCATAGGAAAGAGCTAGCGCTGAACACAGCCCAGTTGCAAAGAGT  
CTAGCCATGCTGGGAGCTCTGAGGACAACACGGCATTGTCAGGGCACTCTCCAGCTGGCTGAGGTGG  
AAGAAAAATTGAGCAGCTCCACCAGGAACAGGCCAACAAATGACTTCTCCTCTGAGCTCTGAG  
TGACTACATTGCCCTCCGCCATAGTCAGCGCTGCCCTCGACCAGCGCATGAAGACATGGCAGCGCTGG

CAGGATGCCAAGCCACACTGCAGAAGAAGCGGGAGGCCAGGCCTGGCTGCTGGCCAACAAGCCTG  
ATAAGCTGCAGCAGGCCAAGGACGAGATCCTCGAGTGGGAGTCCTGGGTGACTCAATATGAAAGGACTT  
CGAGAGGATTCAACAGTGGTCCGAAAAGAAGTGTACGGTTGAGAAAGAGAAATCCAAGGACTCAAG  
AACCAAGTGTATCAAGTACCTTGAGACACTCCTTACTCACAGCAGCTGGCAAAGTACTGGGAAGCCT  
TCCTCTGAGGCAAAGGCCATCTCTAG

Human SNX1 mRNA sequence - var4 (public gi: 4884359) (SEQ ID NO: 155)  
GGTGCTTGTAAAGTCCATCTAATGATCATTCTGACGTAAGTCTGTTTCTTATTTCTTGGAAATGA  
TGTCTCCTCTGGTTCAGAACCTCCTCTGCTTCCTGTATCCCTGAGGCTGGGGCCAGTTGTCTTT  
AGGGCTTGTGATTTGTAAAGAGCTGACGTCAGTGGAAATCAAGTAGGCCAGTAGTGGTTAGGGTA  
CTGAGGCCAGAACGCCCTACAAGGAATAACAGGACACAAAGGAAGAAGGTGGTATTCCAGCTGGGACCC  
AGGAGGGAGGACTTGTGGAGAACCTGTGACTGAGTCTAAAGGTGAAAGTGTGCTT  
CTGCCCTCCCTGCTGCTGGCAGGGTAGGTAGGCCATCTAGGAAATGTCAGTGGCTGGTAGGG  
TAAAGTCAGTGGGCCATGGAGAAAACAGGACAGGAGCCACATCACATGGGTGTCGATAGGACCTGGG  
AGGCCTTCCACATTACCATGTCGCTCGTGATCTGGACACACCAGAACGGCTGAGACTGGAGGCAGG  
AAGAGCAGCCAGGCTTATCCCTACCCCTAGGAGAGCTGAAAGGGCAGGTATGGTGGGCCAGAGCTCAG  
GAGAGTTTCAAACACTGAGATCGGCTCTGATTGATGAGAGGCTTGAGGGAGAGGGAGGTAGCTAG  
GATGCCCGCAAGCTTCTGCCAGACACTGGGAGACAATGAAACCTTGTAAACACATGAGGCAATAG  
GTTTGGGAGATGGAGGGAAAGCAGTGGTGGGGCAGTAGTGGTGAAGGTGTTTAAGAAGCGGCTC  
TGGGCCAGGCACAGTGGCTTATGCCCTGATTCTAGCATTGGGAGGGCCAGGTGGGAGAATCACTTG  
GCCCAAGAATTGAGACCAAGCCTGGGAATATAGTGGAGACCCCTGTCCTACAAAAATAAAACACTAGC  
TGGGTGTGGTGGTGCATGCCCTGAGGCCCAGCTACGGGGAAACATCACCTGAGGCCAGGAGGTGAGG  
TTGAGCTGAGCTACAGTGGCCACTGCACTCCAGGCTAGGTGACAGAGCAAGATCTGTCAAAAAAAA  
AAAACAGCTGGATGGAGGGAGGCCAGTTGCTTAAGTAGGGAGATAGAGTTAAAGGAGGCTTGT  
TTTATTAAAGGTGGGACAAACTTAAGCATGTTAAGGAAACAGGAGAAAGAGAATGACTATCAG  
AGCCATGTTGGAGAAAATGGGTCCAGAGCACAGGAAGGGGACCTGTCAGAGGGTGCTCACTGC  
TGAGGCCACAGGAAGAATCTGAGGTGGAGGGAGGCCAGGGAGGTTCTAGCTGATAATTAA  
AAATTCTGAGATGAGATGTCATATTACCTATTAGCCAAGTTTTAGATAAAAGGTATGGAACC  
TGCTTCCCCCTGGCTAGTCAGCGTTGGCTCCGGAGTGTGAAGATGAGGACTGACTCGAGCTGG  
TGTGATCCCAGTATTCACTGTCAGTACTCAGTGACAAAATAATGAGAGAAACGGGAAATAAGAATGTC  
CCTACACAAAAATACAGCAACTGTTAACTCTTCCCAGAAGATTTCATTCTGAATGTCCTGAGCTAG  
GAACCTAAAAAGCTTGAAGCAACTCAAGTTAAAAAGGGGAGGAACCTCTGGAAATCTCAGGATG  
GGGCAAGATGTGGCTGGAGAGTGTGTTGATGAGGGCGTGTCTTCTGGCAGCACACTCAGGGCCCA  
CGGGAAAGCCCATAGACTTCAGGACATCAAGCCCCAACGGTGGGGATTTCTGGCTCCAAACATAGGAGGACACATCTG  
CCTAGGGGAGGGGAGGGGGGGAGAAGATAATGGGGATCCCTGGCTCCAAACATAGGAGGACACATCTG  
TGCTACAGTGGCCACATGCCCTGGATGTAACACTCTGCTTGGAGACACTGGCTAAGATTCTGCTCCAT  
GTTGGACAGGGCTGCTGATCTGAGATAATGGACAAGAACAACTGAAGGCTGTTCTGGTGCATG  
TGTGACCTGGCATAACTGCATCTGAGATAAGGGTGGTATTACAGTCTCCACCAAATGCTAAACTC  
TGGGGTCTTACCCCTTATAACTCCATGGGCCCCAGCAAGGGTCAAGGCTCAAAACAGGTGTCAAATAGA  
TAACGTGTAATGATTGTTCCCAGTTGCAAGGCTGCCCACCTGGCCTCATACTGTCGTGAAAGGACC  
CAGCTCACCTTCCCTCTTATCTCCAGTCCCTCCAAACAGCGCCGACACCTCATGGAAACTGATTGCA  
AATGTGCTACTTCTCACTTCTGTTGGCCGAGGAGCTGGGTAATGCTGGCTTGGTACCTTAAGCAC  
CCTTCTCCCTCCCCATCTCATTCTCAGAATTACACCTGTCGAGCAGGCCATTTCACATGCCCTAG  
ATGGGAATATAAGTGTAAAGGAGATGTGAAGCATTGCTGTTGTCAGAACACTGAGGATCCTCAT  
AGGCACTCTAGAACCAAACTCTGAAGATGACTAACAGGAATGCCCTCATAGGACTGTTAACGTT  
GCAAAAGCTGAAGCCAATTGAAATGTCATCAGGAGGGGATAAATGAATTATGGTACAGTTACACCGTT  
GAATATTTCACGCCATTGAGATGATATAGCTATATTGACAGGAAACTCATATTTTAGT  
GAAAAAAAGCAGGTTATAGAATTGCACTGATATTACATTTATATAAAACTTATATAGGGAGGATGTTG  
ATTGAAATTGTTAAACTATGGTCACCTCTAGAGATGAAAGTTGCAATTACCTTAAATTAAATACCAT  
TTGTTATTGCTTAAATTGTTATGTATTGTTAAAGAAAATCAAATAAGCTATTTCATTAT  
GGGAAAAAAAAAAAAAA

Human SNX1 mRNA sequence - var5 (public gi: 4406620) (SEQ ID NO: 156)  
ATAAAAGGTATGGAACCTGCTTCCCCCTGGCTAGTCAGCGTTGGGCTCCGGAGTGCTGAAGATGAGG  
ACTGGACTTCGAGCTGGTGTGATCCCAGTATTCACTGTCAGTACTCAGTGACAAAATAATGAGAGAAC  
GGGAATAAGAATTGTCGCTACACAAAAATACAGCAACTGTTAACTCTCCAGAAGATTTCTTCTG  
AATGCTCTGTAGCTAGGAACCTAAAAAGCTTGAAGCAACTCAAGTTAAAAAGGGGAGGAAC  
CTGGAAATCTCAGGATGGGCCAAGATGTGGCTGGAGAGTGTGTTGATGGAGGGCGTGTCTTCTGG  
AGCACACTCAGGGCCACGGGAAGGCCATAGACTTCAGGACATCAAGCCCCAACGGTGGTGGGATTTCC  
CCACCAAGTACTTGGCAGCTAGGGGGAGGGGGAGAAGATAATGGGGATCCCTGGCTCCAAAC  
ATAGGAGGACACATCTGTCAGTGCACATGCCCTGGATGTACACTCTGTCCTGGAGACACTGGCT  
AAGATTCTCTGCTCCATGTTGGACAGGGCTGCTGATCTGAGATAATGGACAAGAACAACTGAAGC

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CTGTCTTCTGGTCATGTGTCACCTGCCGATAACTGCATCTGTGATAAAGTTGGGTGATTACAGTCTC  
CACCAAATGCTAAACTCTGGGTCTTACGCCCTTATAACTCCATGGGCCAGCAAAGGTTCAAGGCTCAA  
AACAGGTGCTAAATAGATAACTGTTGAATGATTGTCAGGCTCTGCCACCTGGCGTTCAT  
CTGTCTGTGAAAGGACCCAGCTACCTTCCCTCTTATCTCCAGTCTTCCCACAGCGGACACCT  
CATGGAAACTGATGCAAATGTGCTACTCTCACTCTGTGTCAGGCCCCGAGGAGGCTGGTTAATGCTGG  
CTTGGTACCTTAAGCACCCCTTCTCCCTCCCCATCTCAGAATTACACCTGTCTGAAGCAGGC  
ATTTTCAATGCCCTAGATGGAATATAAGTGTAGGAGATGTGAAGGATTTGCTGTGTCAGAACAT  
TCACTGAGGATCCTCATAGGCACTCTAGAAACAAATCTGTGAAAGATGACTAACAGAAATGCCGTCA  
TAGCACTGTTACAGTGTGCAAACACTGAAGGCAATTGAAATGTCATCAGGAGGGGATTAATGAATTAT  
GGTACAGTTACACCGTTGAATATTACAGCCATTGAAAGATGATATAGCTATATTGACAAGGAA  
AACTCATATTTTATGAAAGCAGGTTATAGAATTGCAATGATATTCACTATTATATAAAACTTTAT  
ATATGGAAGGATGTTGATTGAAATTGTAATAACTATGGTCACTCTAGAGATGGAAGTTGCATTACCT  
TTAATTAAATACCATTGTATTGCTAAAATTGTATGTTATCGTAAATAAGAAAATCAAAT  
AAAGCTATTTCAATTGGGAAAAAAAAAAAAAA

Human SNX1 mRNA sequence - var6 (public gi: 34535422) (SEQ ID NO: 157)  
TTTCCGCCGCGGGTGGAAAGAAGATGGCTCGGGTGGTGGCTGTAGCGCTTCGGAGAGACTGCCCTCG  
CCCTTCCCCGGCCTGGAGCCGGAGTCCGAGGGGGCGCCGGGGATCAGAACCCGAGGCTGGGACAGCG  
ACACCGAGGGGAGGACATTTCACCGCGCCGCGTGGTCAGTAAACATCAGTCTCCAAAGATAACTAC  
ATCCCTTCTCCCATCAACAATGGCTCAAAGAAAATGGATCCATGAAAGACAAGACCAAGAGCCACAG  
GATCTCTTGCAAGATGCCACAGTGGAGCTATCTTGACAGCACACAAAATACTCAGAAGAAGGTGCTAG  
CCAAACACTCATTCTCCTCAGGAAGCCACAAATTCTCGAAGGCCCAGCCAACCTATGAGGA  
GCTAGAGGAAGAAGAACAGGAGGATCAATTGATTGACAGTCGGTATAACTGATCCTGAGAAGATAGGG  
GATGGTATGAATGCAATATGTTAGCTTACAAAGTACACACAGAACAGCTTACATTGTTAGAAGCAAAC  
AGTTGCACTAAAAGAAGATTAGTGACTIONTCTGGGTCTTTATGAGAAGGTTCCAGGAGGACTCTCA  
GAATGGCTCATTGCTCCACCCCGAGAAGAGCCTCATAGGGATGACAAAAGTGAAGTTGGAAAG  
GAAGATTCTCTGCAAGAATTCTGAAAACGGAGGGCCCTTAGAAAGGTACCTTCAGAGGATTG  
TAAATCATCCTACCATGTTACAGGACCTGACGTCAAGAGAGTTCTGGAAAAAGAAGAGCTGCCACGTGC  
CGTGGTACCCAGACATTGAGTGGTCTGGTCTCTCAAGATGTTCAACAAAGCCACAGATGCCGTAGC  
AAAATGACCATCAAGATGAATGAATCAGACATTGTTGAGGAGAAGGCTCAGGAGGTAGAGTGTGAGG  
AGCAGCGCTTACGGAAACTGCACTGCTGTTGAGAAACTCTAGTCAACCATAGGAAAGAGCTAGCGCTGAA  
CACAGCCCAGTTGCAAAGAGTCTAGCAGTGGAGCTTGAGGACAAACAGGCATTGTCACGGCA  
CTCTCCCAGCTGGCTGAGGTGGAAAGAAAAATTGAGCAGCTCACCCAGGAAACAGGCCAACATGACTTCT  
TCCTCTTGCTGAGCTCTGAGTACTACATTGCCCTCTGGCCATAGTCCGCGCTGCCCTCGACCAGCG  
CATGAAGACATGGCAGCGCTGGCAGGATGCCAACACTGCAAGAAGACGGGAGGCGAGGCTCGG  
CTGCTGTGGGCAACAGGCTGATAAGCTGAGCAGGCAAGGAGATCTCGAGTGGAGTCTCGGG  
TGACTCAATATGAAAGGGACTTCAGAGGATTCAACAGTGGTCAAAGGACTCCTTGTGAGACACTCCT  
AGAGAAATCCAAGGACTTCAGGTCTGAATACTCCTAACCAAGAAGTTGCCAGGTATAGTAAGTTT  
TCTCTACCGTTACAAGTTGTGCTGCTGCTTCCCTCTGAAATGGGTTCTTCTCCGCTACCT  
CAGCTACCTGTTGAGGGCTCAATCTGTTGATTCCCACCTCTTGTGAAAGGAGTTAAAAACA  
TCTCTTAAATAAGAGGAGAAAATCTATTAAACCTATTCTCTGCAAAGGAGGAGAGACTTTCTCTC  
TCTCTTTTTTTTTGGTGTCCCTATCATTAAGCAAGAGCCTTCTTGTGAAACCTTCTGCTT  
CCCTAAGCTGCTCAGGGCTCTGAGTCTGCCCTCTGATGGAAGTCTTATATATAACTAAACCTATT  
TTGTCACCCATCAAACACATCCTCAGTAGACTGTTGAGGTGTGATAATGACTTGTGCT  
TTATCTCATAGACATGAAAGCATGCCCTCTGCCCTCTAGATAGGGTGTCCAAGAGGCTCCTGAAACCTTA  
GGAGGTTCAAAGAAGCTCTAGTGTGCCCAGGAGGAGCTGCCAGCAAGAGGCCCTCAGGAGTTGCA  
CACACAGCCAAAGGGTGTCAACAGATCTGCCCTCTGAGCAGGAGGAGGAGGCTCGTCAAGTCA  
AGGATGGGCTTCCCCCTAGCTGTGTCACAGCTGCTCAAGCTATACTGGTCAAGAGTGGCTTGTGAGCT  
CCTTGTGAGCTGAGCTGCTGACTGCCACTATGGGAGGCCCTGCCACCTCCAGCCCCCTCCATCCAAAGA  
CGCTCTGCCACTGGGCCCCAGGTCTGCTGATCTGTTCTTGTGGGGGGCTAAGGTTGGGCG  
AGGCAACCTGAGACAAGAAAACGCAAACTCTGATTCCTGTACACAGATGCAAGCACCAGGGGAAG  
GGCAGTGGTCAAGTATTCTTTAACAGGTGAAGTTTGAAAAAGTCACTCTCCCTACCCCTCAG  
TATCCTTACCATCAACTTGGTTTATCTCCAGTCTTATATGTTGCTTTACATAGTTGTAAT  
AATATACACATAAAAGTATTGTATCTGCTTTATCATTAACATTGTACATGTTATAAGCATTAACT  
ATATTGTTATATATCTTCAAAAGTGTATCTGAAAGCTGTGTAATTGAGGATCCATAGGGTACTG  
TACCATATAATTGATTGATCCCTGTTGATTCTGGTCAAGGGGTTGTTGTTTGTGTTATGGTA  
ACTTAAAATTGAAATACAATTCAAGATTACAGAAAAGTGCAGGAATATCACAAAGAACCTCTATAT  
ATCTTTTATCCAGATTACTGAGTGTTCACATTCTCATGCCCTTATCTATATTTCATGTTGCATT  
TTCTTAATCATTTGAGAATAATTGCAAGATAACCCATTATGCCAAAACAGTATGCAATTCCCTAAGA  
ACAGGACATTCTCTCTAAGAGAAGAGAATTACTTAAAGCTATTGAGTATTGTTAAGTATTAT  
TATCAAAATCAGGAAGTTAACAGTGAATTACTGTTATCTAACCATGATTCAATTAAATTGCA  
CATTATCCCAATAATGTCCTTGTAGCCATTCTTACCTTGTGCAAGGATCATGTTACATTGTAAC

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TGTGCTCTCAATACTGCAGATTCTCAACTTCTTTGTCTTCATTACCATGACATTTGAAGAATA  
CAGGCTATTTGTCG

Human SNX1 mRNA sequence - var7 (public gi: 38197125) (SEQ ID NO: 158)  
GTGGAAAGATGGCGTCGGTGGCTGTAGCGCTCGGAGAGACTGCCCTCCGCCCTCCCCGG  
CTGGAGCCGGAGTCGGAGGGGGCGGCCGGGGGATCAGAACCCGAGGCTGGGACAGCGACACCGAGGGGG  
AGGACATTTCACCGGCGCCGGTGGTCACTAAACATCAGTCTCAAAGATAACTACATCCCTCTTCC  
CATCAACAATGGCTCAAAGAAAATGGATCCATGAAGAACAGACCAAGAGCCACAGGATCTCTTGCA  
GATGCCACAGTGGAGCTATCCTGGACAGCACACAAAATACTCAGAAGAAGGTGCTAGCCAAAACACTCA  
TTCTCTCCTCCAGGAAGCCACAAATTCTCGAAGCCCCAGCCAACCTATGAGGAGCTAGAGGAAGA  
AGAACAGGAGGATCAATTGATTTGACAGTCGGTAACTGTACCTGAGAAGAGATAGGGATGGTATGAAT  
GCATATGTAGCCTACAAAGTTACAACACAGAACAGCTTACATTGTCAGAAGAACAGTTGCACTAA  
AAAGAAGATTTAGTGAATTCTGGGTCTTATGAGAAGCTTCCAGAAGAGCACTCTCAGAATGGCTCAT  
TGTCCCTCACCAGGGAGAAGAGCCTCATAGGGATGACAAAAGTGAAGTTGGGAAGGAAGATTCTTCT  
TCTCGAGAATTTCTGAAAAACGGAGGGCGCTTAGAAAGGTACCTTCAGAGGATTGTAATCATCCTA  
CCATGTTACAGGACCCCTGACGTCAAGAGACTTCTGGAAAAAGAAGAGCTGCCACGTGCCGTGGTACCCA  
GACATTGAGTGGTCTGGTCTCTCAAGATGTTCAACAAAGCCACAGATGCCGTAGCAAAATGACCATC  
AAGATGAATGAATCAGACATTGGTTGAGGAGAAGCTCCAGGAGGTAGAGTGTGAGGAGCAGCGTTAC  
GGAAACTGCATGCTGTTAGAAACTCTAGTCACCATAGGAAGAGCTAGCGTGAACACAGCCCCAGTT  
TGCAAAAGAGTCTAGCCATGCTGGGAGCTCTGAGGACAAACACGGCATTGTCACGGGCACTCTCCAGCTG  
GCTGAGGTGGAAGAAAAATTGAGCAGCTCCACAGGAACAGGCCAACATGACTTCTCCCTCTGCTG  
AGCTCTGAGTGAACATTCGGCCATAGTCCGCTGCTGCCACGGCAGGGCTGGCTGCTGTGGCC  
GCAGCGCTGGCAGGATGCCAACACTGCAAGAAGAGCGGGAGGGCTGGCTGCTGTGGCC  
AACAGCTGATAAGCTGCAAGGCGAACAGGACAGATCCTGAGTGGAGCTCAGGGTACTCAATATG  
AAAGGGACTTCGAGAGGATTCAACAGTGGTCCGAAAAGAAGTGAACGGTTGAGAAAGAGAAATCAA  
GGACTTCAAGAACACAGTGAATCAGTACCTTGAGACACTCCTTACTCACAGCAGCAGCTGGCAAAGTAC  
TGGGAGCCTTCTTCTGAGGCAAAGGCCATCTCTAATGGACCAAGGACCCAGAGCCCACCTGTGTG  
ACGCTGCTTTTATACACTGCTCTCCACCTGATGGACCCCTAGTGTGATGCATCTGCCCTAGGCTGG  
ACTTAACCCCTCCCTCCCTGCCCCACGACCAACTGCTCCAGTTACTCTAACCGTTATTCATTTAGCT  
TCCATATATATTTCTTACCTAACAGAAATAGTTCTGCTTAAGCAAAGACCTACAAATAGGTGGTGG  
ATTATGGGATGGGTGGAGATTGATATAAATATAAATACAATGTATTTTCAGGATGTGGTTA  
GGAACGGAAATAACGTTTCTGTTACTCCTGATGGTGCATGAAAGTTATGTAATAAAATATTTAA  
AATCAAAAAAAAAAAAAAA

Human SNX1 mRNA sequence - var8 (public gi: 23111033) (SEQ ID NO: 159)  
GGGTGGAAGAAGATGGCGTCGGTGGCTGTAGCGCTCGGAGAGACTGCCCTCCGCCCTCCCCG  
GCCCTGGAGCCGGAGTCGGAGGGGGCGGCCGGGGGATCAGAACCCGAGGCTGGGACAGCGACACCGAGGG  
GGAGGACATTTCACCGGCGCCGGTGGTCACTAAACATCAGTCTCAAAGATAACTACATCCCTCTT  
CCCATCAACAATGGCTCAAAGAAAATGGGATCCATGAAGAACAGACCAAGAGCCACAGGATCTCTTG  
CAGATGCCACAGTGGAGCTATCTGGACAGCACACAAAATACTCAGAAGAAGGTGCTAGCAAAACACT  
CATTCTCTCTCCTCAGGAAGGCCAAATTCTCGAAGCCCCAGCCAACCTATGAGGAGCTAGAGGAA  
GAAGAACAGGAGGATCAATTGATTTGACAGTCGGTATAACTGATCCTGAGAAGATAGGGATGGTATGA  
ATGCATATGTAGCCTACAAAGTTACAAACACAGACAAGCTTACCATGTCAGAAGAACAGTTGCACT  
AAAAAGAAGATTTAGTGAATTCTGGTCTTATGAGAAGCTTCCAGAAGCAGCTCAGAACATGGCTTC  
ATTGCTCCCTCCGCCCCGGAGAAGAGCCTCATAGGGATGACAAAAGTGAAGTTGGGAAGGAAGATTCTT  
CTTCTGAGAATTCTGAAAAACGGAGGGCGCTTAGAAAGGTACCTCAGAGGATTGTAATCATCC  
TACCATGTTACAGGACCCCTGACGTCAAGAGTTCTGGAAAAGAAGAGCTGCCACGTGCCGTGGTAC  
CAGACATTGAGTGGTCTGGTCTCCTCAAGATGTTCAACAAAGCCACAGATGCCGTAGCAAAATGACCA  
TCAAGATGAATGAATCAGACATTGGTTGAGGAGAAGCTCAGGAGGTAGAGTGTGAGGAGCAGCGCTT  
ACGGAAACTGCATGCTGTTGAGAAACTCTAGTCACCATGAGGAAGAGCTAGCGTGAACACAGCCCCAG  
TTTGCAGGAGGCTAGCCATGCTGGAGCTCTGAGGACAAACAGGCCATTGTCACGGGCACTCTCCAGC  
TGGCTGGAGTGGAGAAGAAAATTGAGCAGCTCCACAGGAACAGGCCAACATGACTTCTCTCTTGC  
TGAGCTCTGAGTGAATCATTGCTCTGGCCATAGTCCGCTGCCCTCGACAGCGCATGAAAGACA  
TGGCAGCGCTGGCAGGATGCCAACACTGCAAGAAGAGCGGGAGGGCAGGCTGGCTGCTGTGG  
CCAAACAAGCGCTGATAAGCTGCAAGGCCAAGGACAGGAGATCCTCGAGTGGAGCTCGGGTACTCAATA  
TGAAAGGGACTTCGAGAGGATTCAACAGTGGTCCGAAAAGAAGTGAACGGTTGAGAAAGAGAAATCC  
AAGGACTTCAAGAACACACGTGATCAAGTACCTTGAGACACTCCTTACTCACAGCAGCAGCTGGCAAAGT  
ACTGGGAAGCCTTCTTCTGAGGCAAAGGCCATCTCTAATGGACCAAGGACCCAGAGCCCACCTGTG  
TGACGCTGCTTTTATACACTGTCCTCCTCCACCTTGTGACGGCTAGTGTGATGCATCCTGCCCTAGGCT  
GGACTTAACCCCTCCCTGCCCCACGACCAACTGCTCCAGTTACTCTAACCGTTATTCATTTAG  
CTTCCATATATATTTCTTACCTAACAGAAATAGTTCTGCTTAAGCAAAGACCTACAAATAGGTGGTGG  
GAATTATGGGATGGGTGGAGTATTGATATAAATATAAATACAATGTATTTTCAGGATGTGGTT

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TAGGAACGGAAATAACGTTTCTGTTACTCCTGATGGTGCCATGAAAAGTTATGTAATAAAATATTT  
AAAATCAAAAAAAAAAAAAAAA

Human SNX1 mRNA sequence - var9 (public gi: 23111035) (SEQ ID NO: 160)  
GGGTGGAAGAAGATGGCGTCGGGTGGTGGCTGTAGCGCTCGGAGAGACTGCCTCCGCCCTCCCCG  
GCCTGGAGCGGAGTCCGAGGGGGCGGGCGGGGATCAGAACCCGAGGCTGGGACAGCGACACCGAGGG  
GGAGGACATTTCACCGGCCGCGGGTGGTCAGTAACATCAGTCTCAAAGATAACTACATCCCTCTT  
CCCATCAACAATGGCTCCAAAGAAAATGGGATCCATGAAGAACAGAACAGAGGCCACAGGATCTTTG  
CAGATGCCACAGTGGAGCTATCCTGGACAGCACACAAAATACTCAGAAGAAGGTGCTAGCCAAAACACT  
CATTCTCTCCCTCAGGAAGCCACAAATTCTCGAAGGCCCCAGCCAACCTATGAGGAGCTAGAGGAA  
GAAGAACAGGAGGATCAATTGATTTGACAGTCGGTATAACTGATCCTGAGAAGATAGGGATGGTATGA  
ATGCATATGAGCTTACAAACAGAACAGCTTACATTGTTCAAGAACAGTTCAGAAGCAAACAGTTGCAGT  
AAAAGAAGATTAGTGACTTTCTGGGTCTTTATGAGAAGCTTCCGAGAAGCACTCTCAGAATGGCTTC  
ATTGCCCCCGCCCCGGAGAACAGGCTCATAGGGATGACAAAAGTGAAGAGTTGGGAAGGAAGATTCTT  
CTTCTGCAGAATTCTGAAAAACGGAGGGCCGCTTAGAAAGGTACCTTCAGAGGATTGTAATCATCC  
TACCATGTTACAGGACCCCTGACGTCAAGAGAGTTCTGGAAAAGAAGAGCTGCCACGTGCCGTGGTACC  
CAGACATTGAGTGGTGTCTCCTCAAGATGTTCAACAAAGCCACAGATGCCGTAGCAAAATGACCA  
TCAAGATGAATGAATCAGACATTGGTTGAGGAGAACAGCTCAGGAGGTAGAGTGTGAGGAGCAGCGTT  
ACGGAAACTGCATGCTGTTAGAAACTCTAGTCACCATAGGAAAGAGCTAGCGCTGAACACAGCCAG  
TTTGCAGAAGAGTCTAGCCATGCTGGGAGCTCTGAGGACAACACGGCATTGTCACGGCACTCTCCAGC  
TGGCTGAGGTGGAGAAGAAAAAAATTGAGCAGCTCCACCCAGGAACAGGCAACAATGACTCTTCCCTCTG  
TGAGCTCTGAGTGACTACATTGCCCTCTGGCCATAGTCCGCTGGGAGTCTCGGGTGAUTCAATGAA  
AGGGACTTCGAGAGGATTCAACAGTGGTCCGAAAAGAAGTGAACGGTTGAGAAAAGAGAAATCCAAGG  
ACTTCAGAACACAGTGTACAGTACCTTGGAGACACTCCTTACTCACAGCAGCTGGCAAAGTACTG  
GGAAGCCTCTCTCTGAGGCAAAGGCCATCTCTAACATGGACCAAGGACCCAGAGGCCACCTGTGTGAC  
GCTGCCCTTTTATACACTGTCTCTCCACCTTGATGGACCCCTAGTGTATGCATCTGCCCTAGGCTGGAC  
TTAACCCCTTCTCCCTGCCCCAGACCAACTGTCCCCAGTTACTCTAACCGTTATTCATTTAGCTTC  
CATATATTTCTTACCTAAGAGAATAGTTCTGTTAACGAAAAGACCTACAATAGGTGGTGGAAAT  
TATGGGATGGGGTGGAGTATTGATATAAATATAAATACAATGTATATTTTCAGGATGTGGTTAGG  
AACTGGGAATAACGTTTCTGTTACTCCTGATGGTGCCATGAAAAGTTATGTAATAAAATATTTAAAA  
TCAAAAAAAAAAAAAAA

Human SNX1 mRNA sequence - var10 (public gi: 23111031) (SEQ ID NO: 161)  
GGGTGGAAGAAGATGGCGTCGGGTGGTGGCTGTAGCGCTCGGAGAGACTGCCTCCGCCCTCCCCG  
GCCTGGAGCGGAGTCCGAGGGGGCGGGCGGGGATCAGAACCCGAGGCTGGGACAGCGACACCGAGGG  
GGAGGACATTTCACCGGCCGCGGGTGGTCAGTAACATCAGTCTCAAAGATAACTACATCCCTCTT  
CCCATCAACAATGGCTCCAAAGAAAATGGGATCCATGAAGAACAGAACAGAACAGCTTACATTGTTCAAG  
CAGGGGATGGTGAATGCAATGAGCTTACAAAGTTACACAGAACAGCTTACATTGTTCAAGAAC  
AAACAGTTGAGTAAAAGAAGATTAGTGACTTTCTGGGTCTTTATGAGAAGCTTCCGAGAAGCAC  
TCTCAGAATGGCTCATGGCTCCCTCCGGAGAACAGGCTCATAGGGATGACAAAAGTGAAGATTG  
GGAAGGAAGATTCTCTCTGAGAATTCTGAAAAACGGAGGGCCGCTTAGAAAGGTACCTTCAGAG  
GATTGTAATCATCTTACCATGTTACAGGACCCCTGACGTCAAGAGAGTTCTGGAAAAGAAGAGCTGCCA  
CGTGGCGTGGGTACCCAGACATTGAGTGGTGTCTCTCAAGATGTTCAACAAAGCCACAGATGCCG  
TCAGCAAAATGACCATCAAGATGAATCAGACATTGGTTGAGGAGAACAGCTCAGGAGGTAGAGTG  
TGAGGAGCAGCGCTTACGGAAACTGCATGCTGTTAGAAACTCTAGTCACCATAGGAAAGAGCTAGCG  
CTGAACACAGCCAGTTGCAAAGAGTCTAGCCATGCTGGGAGCTCTGAGGACAACACGGCATTGTCAC  
GGGCACTCTCCAGCTGGCTGAGGTGGAGAAGAAAAAAATTGAGCAGCTCCACCCAGGAACAGGCCAACATGA  
CTTCTCTCTCTGCTGAGCTCTGAGTGACTACATTGCCCTCTGGCCATAGTCCGCGCTGCCCTCGAC  
CAGCGCATGAACACATGGCAGCGCTGGCAGGATGCCAACACTGAGAACAGGGAGGGCCGAGG  
CTCGGCTGCTGGGGCAACAGCCTGATAAGCTGAGCAGGCCAACAGGAGATCCTCGAGTGGAGTC  
TCGGGTGACTCAATATGAAAGGGACTTCGAGAGGATTCAACAGTGGTCCGAAAAGAAGTGAACGGTTT  
GAGAAAGAGAAAATCCAAGGACTTCAGAACACCAGTGATCAAGTACCTTGAGAAGACTCTTACTCACAGC  
AGCAGCTGGCAAAGTACTGGAAAGCCTCTCTGAGGCAAAGGCCATCTCTAACATGGACCAAGGACCC  
CAGAGCCCACCTGTGTGACGCTGCCCTTATAACTGTCCTCTCCACCTTGATGGACCCCTAGTGATG  
CATCTGCCCTAGGCTGGACTTAACCCCTTCTCCCTGCCCCAGACCAACTGTCCCCAGTTACTCTAAC  
CGTTATTCATTTAGCTTCCATATATATTTCTTACCTAACAGAGAATAGTTCTGTTAACGAAAAGAC  
CTACAATAGGTGGTGGAAATTGGGATGGGGTGGAGTATTGATATAAATATAAATACAATGTATATT  
TTTCAGGATGTGGTTAGGAACGGAAATAACGTTTCTGTTACTCCTGATGGTGCCATGAAAAGTTAT  
GTAATAAAATATTTAAAATCAAAAAAAAAAAAAAAA

Human SNX1 protein sequence - var1 (public gi: 23111032) (SEQ ID NO: 281)

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MASGGGGCSASERLPPPFPGLEPESEGAAGGSEPEAGDSDEGEDIFTGAAVVSKHQSPKITTSLPINN  
GSKENGIHEEQDQEPPQDLFAGDMNAYVAYKVTTQTSPLFRSKQFAVKRRFSDFLGLYEKLSKHSQNG  
FIVPPPPEKSЛИGМТKVVGKEDSSSAEFLERAAALERYLQRIVNHPTMLQDPDVREFLEKEELPRAVG  
TQTLSGAGLLKMFNКАTDAVSKMTIKMNESDIWFEEKLQEVECEEQRLRKLHAVVETLVNHRKELALNTA  
QFAKSLAMLGSSEDNTALSRALSQLAEVEEKIEQLHQEQANNDFFLLAELLSDYIRLLAIVRAAFDQRMK  
TWQRWQDAQATLQKKREAEARLLWANKPDKLQQAKDEILEWESRVTQYERDFERISTVVRKEVIRFEKEK  
SKDFKNHVIKYLETLLYSQQQLAKYWEAFLPEAKAIS

Human SNX1 protein sequence - var2 (public gi: 23111036) (SEQ ID NO: 282)  
MASGGGGCSASERLPPPFPGLEPESEGAAGGSEPEAGDSDEGEDIFTGAAVVSKHQSPKITTSLPINN  
GSKENGIHEEQDQEPPQDLFADATVELSLDSTQNQKKVLAKTLISLPPQEATNSSKPQPTYEELEEEQE  
DQFDLTVGITDPEKIGDGMAVAYKVTTQTSPLFRSKQFAVKRRFSDFLGLYEKLSKHSQNGFIVPP  
PPEKSЛИGМТKVVGKEDSSSAEFLERAAALERYLQRIVNHPTMLQDPDVREFLEKEELPRAVGQTLS  
GAGLLKMFNКАTDAVSKMTIKMNESDIWFEEKLQEVECEEQRLRKLHAVVETLVNHRKELALNTAOFAKS  
LAMLGSSEDNTALSRALSQLAEVEEKIEQLHQEQANNDFFLLAELLSDYIRLLAIVRAAFDQRMKTWQRW  
RISTVVRKEVIRFEKEKSDFK  
NHVIKYLETLLYSQQQLAKYWEAFLPEAKAIS

Human SNX1 protein sequence - var3 (public gi: 12653179) (SEQ ID NO: 283)  
MASGGGGCSASERLPPPFPGLEPESEGAAGGSEPEAGDSDEGEDIFTGAAVVSKHQSPKITTSLPINN  
GSKENGIHEEQDQEPPQDLFADATVELSLDSTQNQKKVLAKTLISLPPQEATNSSKPQPTYEELEEEQE  
DQFDLTVGITDPEKIGDGMAVAYKVTTQTSPLFRSKQFAVKRRFSDFLGLYEKLSKHSQNGFIVPP  
PPEKSЛИGМТKVVGKEDSSSAEFLERAAALERYLQRIVNHPTMLQDPDVREFLEKEELPRAVGQTLS  
GAGLLKMFNКАTDAVSKMTIKMNESDIWFEEKLQEVECEEQRLRKLHAVVETLVNHRKELALNTAOFAKS  
LAMLGSSEDNTALSRALSQLAEVEEKIEQLHQEQANNDFFLLAELLSDYIRLLAIVRAAFDQRMKTWQRW  
QDAQATLQKKREAEARLLWANKPDKLQQAKDEILEWESRVTQYERDFERISTVVRKEVIRFEKEKSDFK  
NHVIKYLETLLCSQQQAGEQLGIRSGILLTKLPRYSKFFSTVHKCAAASLWKWGFPLSAYLSYLF

Human SNX1 protein sequence - var4 (public gi: 34535423) (SEQ ID NO: 284)  
MASGGGGCSASERLPPPFPGLEPESEGAAGGSEPEAGDSDEGEDIFTGAAVVSKHQSPKITTSLPINN  
GSKENGIHEEQDQEPPQDLFADATVELSLDSTQNQKKVLAKTLISLPPQEATNSSKPQPTYEELEEEQE  
DQFDLTVGITDPEKIGDGMAVAYKVTTQTSPLFRSKQFAVKRRFSDFLGLYEKLSKHSQNGFIVPP  
PPEKSЛИGМТKVVGKEDSSSAEFLERAAALERYLQRIVNHPTMLQDPDVREFLEKEELPRAVGQTLS  
GAGLLKMFNКАTDAVSKMTIKMNESDIWFEEKLQEVECEEQRLRKLHAVVETLVNHRKELALNTAOFAKS  
LAMLGSSEDNTALSRALSQLAEVEEKIEQLHQEQANNDFFLLAELLSDYIRLLAIVRAAFDQRMKTWQRW  
QDAQATLQKKREAEARLLWANKPDKLQQAKDEILEWESRVTQYERDFERISTVVRKEVIRFEKEKSDFK  
NHVIKYLETLLCSQQQAGEQLGIRSGILLTKLPRYSKFFSTVHKCAAASLWKWGFPLSAYLSYLF

Human SNX1 protein sequence - var5 (public gi: 3152942) (SEQ ID NO: 285)  
MASGGGGCSASERLPPPFPGLEPESEGAAGGSEPEAGDSDEGEDIFTGAAVVSKHQSPKITTSLPINN  
GSKENGIHEEQDQEPPQDLFADATVELSLDSTQNQKKVLAKTLISLPPQEATNSSKPQPTYEELEEEQE  
DQFDLTVGITDPEKIGDGMAVAYKVTTQTSPLFRSKQFAVKRRFSDFLGLYEKLSKHSQNGFIVPP  
PPEKSЛИGМТKVVGKEDSSSAEFLERAAALERYLQRIVNHPTMLQDPDVREFLEKEELPRAVG  
TQTLSGAGLLKMFNКАTDAVSKMTIKMNESDIWFEEKLQEVECEEQRLRKLHAVVETLVNHRKELALNTA  
QFAKSLAMLGSSEDNTALSRALSQLAEVEEKIEQLHQEQANNDFFLLAELLSDYIRLLAIVRAAFDQRMK  
TWQRWQDAQATLQKKREAEARLLWANKPDKLQQAKDEILEWESRVTQYERDFERISTVVRKEVIRFEKEK  
SKDFKNHVIKYLETLLYSQQQLAKYWEAFLPEAKAIS

Human SNX1 protein sequence - var6 (public gi: 3152940) (SEQ ID NO: 286)  
MASGGGGCSASERLPPPFPGLEPESEGAAGGSEPEAGDSDEGEDIFTGAAVVSKHQSPKITTSLPINN  
GSKENGIHEEQDQEPPQDLFADATVELSLDSTQNQKKVLAKTLISLPPQEATNSSKPQPTYEELEEEQE  
DQFDLTVGITDPEKIGDGMAVAYKVTTQTSPLFRSKQFAVKRRFSDFLGLYEKLSKHSQNGFIVPP  
PPEKSЛИGМТKVVGKEDSSSAEFLERAAALERYLQRIVNHPTMLQDPDVREFLEKEELPRAVGQTLS  
GAGLLKMFNКАTDAVSKMTIKMNESDIWFEEKLQEVECEEQRLRKLHAVVETLVNHRKELALNTAOFAKS  
LAMLGSSEDNTALSRALSQLAEVEEKIEQLHQEQANNDFFLLAELLSDYIRLLAIVRAAFDQRMKTWQRW  
QDAQATLQKKREAEARLLWANKPDKLQQAKDEILEWESRVTQYERDFERISTVVRKEVIRFEKEKSDFK  
NHVIKYLETLLYSQQQLAKYWEAFLPEAKAIS

Unigene Name: SNX3 Unigene ID: Hs.12102

Human SNX3 mRNA sequence - var1 (public gi: 23111040) (SEQ ID NO: 162)

CTGTTTGCACCCCGAGTCCCAGCACCGCTTCCTCACACCCAGTCCGAGTCCCCCTCCCCAGCC  
TCGGCGGGGCTCCCGGGAGCCGGCGTGGCGTCCAGCTAGTGAGCCGTTCTCCCTGGGCTCGGAGG  
CGGAAGCTTGAGGGGCGCGGGAGGAGCTTCGCGTGCAGGGTGAACGCCGCTACGTGCTCGTCT  
TCGCGACCGCTGCGCGAGCCCCGTGCCCCACGGCGGGCAGCAGCGGGCGGGCGCTGAACCG  
GAGGGGGCGGAGGGAGCCCGCGGGGGCAGCAGCTACAGCGAAATGGCGGAGACCGTGGCTGACACCC  
GGCGCTGATCACCAAGCCAGAACCGTGAATGACGCCAACGGGACCCCCCAGCAACTTCCGAGATCGA  
TGTGAGCAACCCCAAACGGTGGGGTGGCGCCGGGCTTACCAACTTACGAAATCAGGGTCAAGGTC  
GTAGTTCCCCCGCTCCCTGGGAAAGCGTTTGGCGTCAAGCTTACGGAGATTATAAACAGGTGCTGGTCA  
ATGACAATTATTGAGGAAAGAAAACAAGGGCTGGAGCAGTTATAAACAGGTGCTGGTCA  
GGCACAGAACGAAACGGTCTTCACATGTTTACAAGATGAAATAATAGATAAAAGCTATACTCCATCT  
AAAATAAGACATGCCTGAAATTGGCAAGAAGGGCAAAACGTGACTATTAAATGATTGATAAGCACCAG  
TGAAGAAGTTCTAACTTTAGCATGCTGACAGAAACTGGTATAACATGCCCTCAGTATAACTAACACTCA  
TATGCTCAGTTTGTGTTGGAGCAGTTGACAAGAAGTTAATTGCTTAGTAAAATCCCTCATC  
AGCCTTCTATATAAACAGCTTTCTGCTGTTTAATGTGGTGCACACTATAGCCTCACAAACCTGTT  
ATTCCAGTGTAACTGCACTGTAACAAAGTTACTGGCTGGCTTATTGACAGTGGCT  
TGGTGTGTTCTGATCTGATTAACAGGAAATTTCTCTTCCCTTTAATTGATGTCACCTTGAC  
CCCATTATGTGAGGAGCAGTACACCAATTGGTTCCAATCTGCACACATAAGATAACATACTTGTGTGC  
AGAAAGTATCTCCAGGCTGTAAATACCCCTCACATGGAAGATTAAATGAGGAAATCTTATATTCT  
GTATAAAAACAAAAGCAAATTATATACTAAATCATTGCTAAAAATTAAAGTTGTTTCAAATAAAA  
ATTAATGCAATTCTGATATGCAAAAAAAAAAAAAAA

Human SNX3 mRNA sequence - var2 (public gi: 34304375) (SEQ ID NO: 163)  
GTCGGCGGAACCTGTTGCGACCCCGAGTCCCAGCACCCGCTCTCCTCACACCCAGTCCGAGTG  
CCCCCTCCCGCCTCGGGGGGCTCCCGGGAGCCGGCGTGGCGTCCAGCTAGTGAGCCGTTCTCCC  
CTGGCGTGGAGGGCGGAAGCTTGAGGGGGGGAGGAGCTTCGCGTGCAGGGTGAACGCCGCTCTAC  
GTGCGTGGCTCTTCGCGACCGCTGCGCGAGCCCCGTGCCCCACGGCGGGCAGCAGCGCGGGCG  
GCGCTGAACCGGGAGGGGGCGGAGGGAGCCCGGGCGGGCAGCAGCTACAGCGAAATGGCGAGACC  
GTGGCTGACACCCGGCGCTGATCACCAAGCCAGAACCTGAAATGACGCCAACGGGACCCCCAGCAACT  
TCCCTGAGATCGATGTGAGCAACCCGAAACGGTGGGGTCCGGCGGGGGCTTCAACACTTACGAAAT  
CAGGGTCAAGACAAATCTTCTATTTCAGCTGAAAGAAATCTACTGTTAGAAGAAGATACTGACTTT  
GAATGGCTGCAAGTGAATTAGAAAGAGAGCAAGCCCTGCTCAGAATGACATCAGAGGCAAGGAGTC  
ATGGAAGGACGTGGTGTGCTCAGAATGATGAAAGTTATTGACTAGAAAGTCTGAGTCCCCCGCT  
CCCTGGGAAAGCGTTTGTGCTCAGCTTCTTTAGAGGAGATGGAATATTGATGACAATTATTATT  
GAGGAAAGAAAACAAGGGCTGGAGCAGTTATAAACAAAGGTGCTGGTCACTCTGGCACAGAAC  
GTTGCTTCTCACATGTTTACAAGATGAAATAATAGATAAAAGCTATACTCCATCTAAATAAGACATGC  
CTGAAAATTGGCAAGAAGGGCAAAACGTGACTATTAAATGATTGATAAGCACCAGTGAAGAAGTTCTAA  
CTTTAGCATGTCAGACAGAAACTGGTATAACATGCCCTCAGTATAACTACACTCATATGCTCAGTTTG  
TTTGTGTTGGCAGTTGACAAGGTTAATTGCTTAGTAAAATCCCTCATCCAGCCTTCTATATA  
AATAGCTCTTCTGCTGTTTAATGTGGTGCACACTATAGCCTCACAAACCTGTTATTCCAGTGTAA  
TGCAGTGTGTAACAAAGTTACTGGCTGGCTTATTGACAGTTTGCGTCTTGTGTTGCTTCT  
ATCTGATTAACTAGAATATTCTCTTCCCCCTTTAATTGATGTCACCTGACCCATTATGTGTA  
GGAGCACTACACCATTGGTTCCAATCTGCACACATAAGATAACACTTGTGTGCAGAAAGTATCTCC  
TCCAGGCTGTAAATACCCCTCACATGGAAGATTAAATGAGGAAATCTTATATTCTGATAAAAACAAA  
GCAAATTATATACTAAATCATTGCTAAAAATTAAAGTTGTTTCAAATAAAATTAAATGCATT  
CTGATATGCAAAAAAAAAAAAAAA

Human SNX3 mRNA sequence - var3 (public gi: 34190889) (SEQ ID NO: 164)  
TCGACCCACGCGTCCGCCACGCGTCGCTGTTGCGACCCCGAGTCCCAGCACACCGCTCTCCTCAC  
CCCCAGTCGCACTGCCCCCTCCCGAGCCTCGGCCGGCTCCGGAGCCGGCGTGGCGTCCAGCTAG  
TGAGCCGTTCTCCCTGGCTGGAGGGCGGAAGCTTGAGGGGGCGGGAGGAGCTTCGCGTGCAGGGT  
GAACGCCGCTCTACGTGCTCGTCTTCGCGACCGCTGCGCGAGCCCCGTGCCCCACGGCGGGCA  
GGAGCGGGCGGGCGGGCGCTGAACCGGGAGGGGGCGGAGGGAGCCCGGGCGGGCAGCAGCTACAGC  
GAAATGGCGAGACCGTGGCTGACACCCGGCGCTGATCACCAAGCCGAGAACCTGAAATGACGCC  
GACCCCCCAGCAACTTCTCGAGATCGATGTGAGCAACCCGAAACGGTGGGGTGGCCGGGGCGCTT  
CACCACTACGAAATCAGGGTCAAGACAAATCTTCTATTTCAGCTGAAAGAAATCTACTGTTAGAAGA  
AGATACAGTGAATTGCTGCGAAGTGAATTAGAAAGAGAGAGCAAGCCCTGCTCAGAATGACAT  
CAGAGGCAAGGAGTCATGGAAGGACGTTGCTCAGAATGATGAAAGTTATTGACTAGAAAGT  
CGTAGTCCCCCGCTCCCTGGGAAAGCGTTTGTGCTCAGCTTCTTTAGAGGAGATGGAATATT  
GATGACAATTATTGAGGAAAGAAAACAAGGGCTGGAGCAGTTATAAACAGGTGCTGGTCA  
TGGCACAGAACGAGCTGTCTTACATGTTTACAAGATGAAATAATAGATAAAAGCTATACTCC  
TAAAATAAGACATGCCCTGAAATTGGCAAGAAGGGCAAAACGTGACTATTAAATGATTGATAAGC  
GTGAAGAAGTTCTAACCTTTAGCATGTCGACAGAAACTGGTATAACATGCCCTCAGTATAACTAAC  
ACTC

PCTVUS04/06306

ATATGCTCAGTTGTTGGCAGTTGACAAGAAGTTAATTGCTTAGAAAAATCCCTCATTC  
CAGCCTTCTATATAAATAGCTCTTCTGCTGTTAATGTGGTGCACACTATAGCTCACAAACCTGT  
TATTCCAGTGTAACTGCACTGCGTAACTAAAGTTACTGGCTGGCTTATTGACAGTTTGCGTC  
TTGTTTGCTTCTGATCTGATTAACTAGAAATATTCTCTTCCCCCTTTAATTGTGATGTCATTGA  
CCCCATTTATGTAGGAGCACTACACCATTGGTTCCAATACTGCACACATAAGATAACATACTTGTGTG  
CAGAAAGTATCTCCAGGCTTGTAAATACCCCTCACATGGAAGATTAATGAGGGAAATCTTATATT  
TGTATAAAAACAAAAGCAAATTATACATAAAATCATTTGTCTAAAATTAAAGTTGTTCAAAATAA  
AATTAATGCAATTCTGATATGCAAAAAAAAAAAAAAA

Human SNX3 mRNA sequence - var4 (public gi: 15779011) (SEQ ID NO: 165)  
GGGGCTTCGCGACCGCTCGCGCGAGCCCCGTGCCCCACGGCGGGCAGCAGCGGGCGGGCTG  
AACGGGGGGGGGGAGGGAGCCCAGGGCGAGCAGCTACAGCGAAATGGCGAGACCGTGGCTG  
ACACCCGGGGCTGATCACCAAGCCGAGAACCTGAATGACGCCAACGGACCCCCAGCAACTTCC  
GATCGATGTGAGCAACCGAACGGTGGGGTCCGGCGGGGGCGCTTCAACACTACGAAATCAGGGTC  
AAGACAAATCTCTAATTTCAGCTGAAAGAAATCTACTGTTAGAAGAAGATACTGACTTTGAATGGC  
TGCAGGTGAAATTAGAAAGAGAGCAAGGTCGAGTCCCTGGGAAAGCGTTTGCGTCA  
GCTTCTTTAGAGGAGATGATGGAATATTGATGACAATTATTGAGGAAAGAAAACAAGGGCTGGAG  
CAGTTATAAAACAAGGTCGCTGGTCACTCTGGCACAGAACGTTCTCACATGTTTACAAG  
ATGAAATAATAGATAAAAGCTATACTCCATCTAAATAAGACATGCCGAAATTGGCAAGAAGGGCAA  
AAACGTGACTATTAATGATTGATAAGCACCACTGAAGAAGTCTAACTTTAGCATGTCGACAGAAACT  
GGTATAACATGCCCTCAGTATACTAACACTCATATGCTCAGTTGTTGGCAGTTGACAAGAA  
GTTAATTGCTTAGATAAAATCCCTATTCCAGGCTTCTATATAAAATAGCTTCTGCTGTTAA  
TGTGGTGCACATATGCCCTAACACTGTTATTCCAGTGTAACTCTGCTGAGTGTGTA  
GGCTTGGCTTATTGCACTAGTTGCGTCTTGTGCTTGTGATCTGATTAACAGTAAAGTTACT  
TTTCCCCCTTTAATTGATGTCACTGACCCATTATGTCAGGAGCACTACACCATTGGTTCCA  
ATACTGCACACATAAGATAACATACTGTCAGAAAGTATCTTCCAGGCTGTAATACCCCTCACA  
TGGAGAATTAAAGGGAAATCTTATATTCTGATAAAAACAAAAGCAAATTATACATAAAATCATT  
TGTCTAAAATTAAAGTTGTTCAAAATAAAATTAAAGTCAAAAAAAAAAAAAAA  
AA

Human SNX3 mRNA sequence - var5 (public gi: 15929496) (SEQ ID NO: 166)  
CGCGCGAGCCCCGTGCCCCACGGCGGGCAGCAGCGGGCGGGCGGGCTGAACGCGGAGGGGGCGGAG  
GGAGCCCCGGGGGGGGAGCAGCTACAGCGAAATGGCGGAGACCGTGGCTGACACCCGGCGCTGATCA  
CCAAGCCGAGAACCTGAATGACGCCAACGGACCCCCAGCAACTTCCCGAGATGAGCAACCC  
GCAAACGGTGGGGTCCGGCGGGGGCGCTTCAACACTACGAAATCAGGGTCAGAACAAATCTCTATT  
TTCAAGCTGAAAGAATCTACTGTTAGAAGAAGATACTGACTTTGAATGGCTGCGAAGTGAATTAGAAA  
GAGAGAGCAAGGTCGAGTCCCCCGCTCCCTGGAAAGCGTTTGCCTGAGCTCTTTAGAGGAGA  
TGATGGAATATTGATGACAATTATTGAGGAAAGAAAACAAGGGCTGGAGCAGTTATAAAACAAGGTC  
GCTGGTCACTCTGGCACAGAACGAGCTTGTCTTACATGTTTACAAGATGAAATAATAGATAAAA  
GCTAATCTCATCTGGAAAGACATGCCGAAATTGGCAAGAAGGGCAAACGTGACTATTATGAA  
TTGATAAGCACCAGTGAAGAAGTTCTAACTTTAGCATGTCACAGAACACTGGTATAACATGCCCTCAG  
TATAACTAACACTCATATGCTCAGTTGTTGTTGGCAGTTGACAAGAAGTTAATTGCTTTAGTAA  
AAATCCCTCATCCAGCCTTCTATATAAAATAGCTTTCTGCTTTAATGTTGTCACACTATAGC  
CTCACAAACCTGTTATTCCAGTGTAACTGCACTGCTGTAACAAAGTTACTGGCTGGTCTTATTGCA  
CAGTTTGGCTCTTGTCTTGTGATCTGATTAACAGAATTTCTCTTCCCCCTTTAATTG  
TGATGTCACTTGACCCATTATGTCAGGAGCACTACACCATTGGTTCCAATACTGCACACATAAGAT  
ACATACTTGTCAGAAAGTATCTTCCAGGCTGTAATACCCCTCACATGGAAGATTAATGAGGGAA  
AATTTTATATTCTGATAAAAACAAAAGCAAATTATACATAAAATCATTTGTCTAAAATTAAAGTT  
GTTTCAAAATAAAATTAAAGTCAATTCTGATATGCAAAAAAAAAAAAAAA

Human SNX3 mRNA sequence - var6 (public gi: 14250078) (SEQ ID NO: 167)  
AGCCCCGTGCCCCACGGCGGGCAGCAGCGGGCGGGCTGAACGCGGAGGGGGCGGAGGGAGCC  
CGCGCGGGCGGGCAGCAGCTACAGCGAAATGGCGGAGACCGTGGCTGACACCCGGGGCTGATC  
CGCAGAACCTGAATGACGCCAACGGACCCCCAGCAACTTCCCGAGATGAGCAACCCGAAAC  
GGTGGGGTGGCCGGGGGGCGCTTCAACACTACGAAATCAGGGTCAGAACAAATCTCTATTTCAG  
CTGAAAGAATCTACTGTTAGAAGAAGATACTGACTTTGAATGGCTGCGAAGTGAATTAGAAAGAGA  
GCAAGGTCGAGTCCCCCGCTCCGGAAAGCGTTTGTGCTGAGCTCTTTAGAGGAGATGATGG  
AATATTGATGACAATTATTGAGGAAAGAAAACAAGGGCTGGAGCAGTTATAAAACAAGGTGCTGGT  
CATCCTCTGGCACAGAACGAGCTGTCCTCACATGTTTTACAAGATGAAATAATAGATAAAAGCTATA  
CTCCATCTAAAATAAGACATGCCGAAATTGGCAAGAAGGGCAAACAGTGCACACTATTGATGATA  
AGCACCACTGAGAAAGTTCTAACTTTAGCATGCTGCACAGAACACTGGTATAACATGCCCTCAGTAACT  
AACACTCATATGCTCAGTTGTTGGCAGTTGACAAGAAGTTAATTGCTTTAGTAA

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CTCATTCCAGCCTTCTATATAAATAGCTTTCTTGGCTGTTTAATGTGGTCACACTATAGCCTCACAAACCTGTTATTCCAGTGTAACTGCAGTGTGCGTAACCTAAAGTTACTGGCTGGTCTTATTGCACAGTTTTGCGTCTTGTGTTGCTTCTTGCACTCTGATTAACAGAATATTCTCTTCCCCCTTTAATTGTGATGTCACCTTGACCCCCATTATGTGTAGGAGCACTACACCATTGGTTCAAACTGTCACACATAAGATAACATACTTGTGTGCCAGAAAGTATCTTCCTCCAGGCTGTAATACCCCTTCACATGGAAGATTAAATGAGGGAAATCTTATATTCTGTATAAAAACAAAAGCAAATTATATACTAAATCATTTGTCTAAAAATTAAAGTTGTTTCAAAAA

Human SNX3 mRNA sequence - var7 (public gi: 12957159) (SEQ ID NO: 168)  
GGGCGAGGAGGGAGCCCGCGGCCGGCAGCAGCTACAGCAAATGGCGGAGACCGTGGCTGACACCCGG  
CGGCTGATACCAAGCCGAGAACCTGAATGACGCCAACGGACCCCCCAGCAACTTCCTGAGATCGATG  
TGAGCAAACCGCAAACGGTGGGGTCCGGCCGGGCCCTCACCAACTACGAAATCAGGGTCAAGGTCTG  
AGTTCCCCCGCTCCCTGGAAAGCGTTTGCCTCAGCTCCCTTAGAGGGAGATGATGAAATTGAT  
GACAATTATTGAGGAAAGAAAACAAGGGCTGGAGCAGTTATAAACAAAGGTGCTGGCATCCTCTGG  
CACAGAACGAACGTTGCTTCACATGTTTACAAGATGAAATAAGATAAAAGCTATACTCCATCTAA  
AATAAGACATGCCGAAATTGGCAAGAAGGGCAAAACGTGACTATTATGATTGATAAGCACCAGTG  
AAGAAGTTCTAACTTTAGCATGCTGACAGAACTGGTATAACATGCCCTCAGTATACTAACACTCTATA  
TGCTCAGTTTGTGTTTGTGTTGCAAGTTGACAAGAAGTTAATTGCTTTAGTAAAAACCTCTCATTCCAG  
CCTTTCTATATAAAAGCTCTTCTGCTGTTTAATGCTGGTCAACATATAGCCTCACAAACCTGTAT  
TCCAGTGTAACTGCACTGTCGTAACCTAAAGTTACTGGCTTGGCTTATTTGACAGTTTGTGCTCTTG  
TTGCTTCTGTCATGTTAAGAATTCTCTTCTCCCCCTTTAATTGATGTCACTTGACCC  
CATTATGTGTAGGAGCACTACACCATTGTTCCAATACTGCACACATAAGATACTACTGTGTGCA  
AAAGTATCTCCTCCAGGCTGTAATACCCCTCACATGGAAGATAATGAGGGAAATCTTATATTCTGT  
ATAAAAACAAAAGCAAATTATATACTAAATCATTGCTAAAAATTAAAGTTGTTTCAAATAAAAAT  
TAAATGCAATTGATATGCAAAAAAAAAAAAAAAAAAAAAAA

Human SNX3 mRNA sequence - var8 (public gi: 34304374) (SEQ ID NO: 169)  
GTCCGGCGGAACCTGTTGCGACCCCGAGTCCCATGACACCGCTTCTCCTCACACCCCACTCCGCAGTG  
CCCCCTCCCCAGCCTCGGCCGGCTCCGGAGGCCGGCTGGCGTTCCAGCTAGTGAACCGTTCTCCC  
CTGGGCTCGGAGGCCGAAGCTTGAGGGCGGGGGAGGGAGCTTCGCGTGCAGGGTGAACGCCGCTCTAC  
GTGCTCGTTCTCTTCGCGACCCGCTGCGCGAGCCCCGTGTCCCCACGGCGGGCAGCAGCGGGCGCG  
GCGGCTGAACCGGGAGGGGGGGAGGGAGGCCGCGGCCGGCAGCAGCTACAGCGAAATGGCGGAGACC  
GTGGCTGACACCCGGCGCTGATACCCAAGCCGAGAACCTGAATGACGCCATGGACCCCCCAGCAACT  
TCCCTGAGATGATGAGAACCCGCAAACGGTGGGGGTGCGCGGGGGCGCTTACCAACTTACGAAAT  
CAGGGCTAAGACAATCTTCTTATTTCAAGCTGAAAGAATCTACTGTTAGAGAAAGATACTAGTGA  
GAATGGCTGCGAAGTGAATTAGAAAGAGAGAGCAAGGCTGCTAGTCCCCCGCTCCCTGGAAAGCGTTT  
TGCCTGAGCTCTCTTTAGAGGAGATGATGGAATTATTGATGACAAATTATTGAGGAAAGAAAACAAGG  
GCTGGAGCAGTTATAACAAAGGCTGCTGGTCACTCTCTGGCACAGAACGAACTGTTGCTTACATGTT  
TTACAAGATGAAATAATAGATAAAAGCTATACTCCATCTAAAATAAGACATGCCGAAATTGGCAAGAA  
GGGGCAAAACGTGACTATTAATGATTGATAAGCACCAGTGAAGAAGTTCTAACTTTAGCATGCTGCAC  
AGAAAATGGTATAACATGCCCTCAGTATACTAACACTCATATGCTCAGTTGTTGGCAGTTG  
ACAAGAAGTTAATTGCTTAGTAAAATCCCTATTCCAGCTTCTATATAATAGCTCTTCTGCT  
GTTTAATGTTGTCACACTATAGCCTCACAAACCTGTTATTCCAGTGTAACTGCACTGTCGTA  
AGTTACTGGCTGGTCTTATTGACAGTTTGCCTGCTTCTGCTTCTGCTATCTGTA  
ATTTCTCTTCCCCCTTTAATTGATGTCACTTGACCCATTATGTTGAGGAGC  
GTTTCAAAACTGACACACAAGATACATACTGTTGTCAGGAGCTACACCCATTG  
CTTCACATGGAAGATTAATGAGGGAAATCTTATATTCTGTTA  
AAATCATTGCTAAAAATTAAAGTGTGTTCAAAATTTAAATGCA  
AAAAAAAAAAAAAAAAAAAAAA

Human SNX3 mRNA sequence - var9 (public gi: 30583066) (SEQ ID NO: 170)  
ATGGCGAGACCGTGGCTGACACCCGGCGCTGATCACCAAGCCGAGAACCTGAATGACGCCATCGAC  
CCCCCAGCAACTTCCTCGAGATCGATGTGAGCAACCCGAAACGGTGGGGTCGGCCGGGCGCTTCAC  
CACTTACGAAATCAGGGTCAAGACAAATCTTCCTATTTCAGCTGAAAGAACTACTGTTAGAAGAAGA  
TACAGTGACTTGAATGGCTGCGAAGTGAATTAGAAAAGAGAGAGCAAGGTCGTAGTTCCCCGCTCCCTG  
GGAAAGCGTTTTCGGTCAGCTTCCTTTAGAGGAGATGGAAATATTGATGACAATTTATTGAGGAA  
AAGAAAACAAGGGCTGGAGCAGTTATAAACAAAGGTCCGCTGGTACATCCTCTGGCACAGAACGAACGTGT  
CTTCACATGTTTACAAGATGAAATAATAGATAAAAGCTATACTCCATCTAAAATAAGACATGCCAG

Human SNX3 mRNA sequence - var10 (public gi: 3127052) (SEQ ID NO: 171)  
GGGCGAGGAGGGAGCCCGCGGCCGGCAGCAGCTACAGCAGAAATGGCGGAGACCGTGGCTGACACCCGG

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CGGCTGATCACCAAGCCGCAGAACCTGAATGACGCCAACGGACCCCCCAGCAACTCCTCGAGATCGATG  
TGAGCAACCCGCAAACGGTGGGGTCGGCCGGGGCGCTTACCAACTACGAAATCAGGTCAAGACAAA  
TCTTCCTATTTCAAGCTGAAAGAATCTACTGTTAGAAGAAGATAACAGTGACTTTGAATGGCTGCGAAGT  
GAATTAGAAAGAGAGAGCAAGGTGCTAGTCCCCCGCTCCCTGGGAAAGCGTTTTGCGTCAGCTCCTT  
TTAGAGGAGATGATGAAATTTGATGACAATTGAGGAAAGAAAACAAGGGCTGGAGCAGTTAT  
AAACAAGGTGCGTGGTCATCCTCTGGCACAGAACCGAACGGTCTTCACATGTTTACAAGATGAAATA  
ATAGATAAAAGCTATACTCCATCTAAAATAAGACATGCCTGAAATTGCGCAAGAAGGGCAAAACGTGA  
CTATTAATGATTGATAAGCACCAGTGAAGAAGTCTAACATTAGCATGCTGACAGAAACTGGTATAAC  
ATGCCCTCAGTATACTAACACTCATATGCTCAGTTGTTGGCAGTTGACAAGAAGTAAATT  
GCTTAGTAAAAACCTCATTCCAGCCTTCTATATAAAAGCTCTTCTGTGTTAATGTTG  
ACACTATGCCACAAACCTGTTATCCAGTGAATCTGCAGTGTGTAACCTAAAGTTACTGGCTTGGT  
CTTATTCGACAGTTTGCCTGTTGCTTGCATCTGATTAACAGTAAATTTCTCTTCCCCC  
TTTAATTCGATGTCATTGACCCCATTATGTTGAGGAGACTACACCATTGGTTCCAATACTGCA  
CACATAAGATAACATACTTGTCAGAAAGTATCTCCTCCAGGTTGTAATACCCTTCACATGGAAGAT  
TAATGAGGAAATCTTATATTCTGTATAAAAACAAAGCAATTATATACTAAAATCATTGCTAAA  
AATTAAAGTTGTTCAAAATAAAATGCAATTCTGATATGCAAAAAAAAAAAAAAAA  
AAAAAAAAAA

Human SNX3 mRNA sequence - var11 (public gi: 3126978) (SEQ ID NO: 172)  
GCGGCACAGCTACAGCGAAATGGCGGAGACCGTGCTGACACCCGGCGGTGATCACCAAGCCGCAGAAC  
CTGAATGACGCCAACGGACCCCCCAGCAACTTCCCTGAGATCGATGTGAGCAACCCGCAAACGGTGGGG  
TCGGCCGGGCGCTTCACCACTTACGAAATCAGGTCAAGGCAAATCTCCTATTTCAGCTGAAAGA  
ATCTACTGTTAGAAGAAGATAACAGTGACTTTGAATGGCTGCGAAGCTGAAATTAGAAAGAGAGGCAAGGTC  
GTAGTCCCCCGCTCCCTGGAAAGCGTTTGCCTGACTCTCCCTTTAGAGGAGATGATGGAATAATTG  
ATGACAATTTCATTGAGGAAAGAAAACAAGGGCTGGAGCAGTTATAAAACAAGGTCGCTGGCATCCTCT  
GGCACAGCAACGTTGCTTCACATGTTTACAAGGATAATAAGATAAAAGCTATACTCCATCT  
AAAATAAGACATGCCGAAATTGGCAAGAAGGGCAAAACCGTGACTATTATGATTGATAAGCACC  
GTGAAGAAGTTCAACTTTAGCATGCTGACAGAAACTGGTATAACATGCCCTCAGTATACTAACACT  
CATATGCTCAGTTGTTGTTGCAAGAAGTTAATTGCTTAGTAAAATCCCTCATT  
CCAGCCTTCTATATAAAATAGCTCCTCTGCTGTTAATGTTGCGACACTATAGCCTCACAAACCTG  
GTTAATCCAGTGAATCTGCAGTGTGCTAACTAAAGTACTGGCTTGGTCTAATTG

Human SNX3 protein sequence - var1 (public gi: 23111041) (SEQ ID NO: 287)  
MAETVADTRRLITKPQNLNDAYGPPSNFLEIDVSNPQTGVGRGRFTTYEIRVKVVVPLPGKAFLRQLP  
FRGDDGIFDDNFIEERKQGLEQFINKVAGHPLAQNERCLHMFQDIEDKSYTPSKIRHA

Human SNX3 protein sequence - var2 (public gi: 23111043) (SEQ ID NO: 288)  
MAETVADTRRLITKPQNLNDAYGPPSNFLEIDVSNPQTGVGRGRFTTYEIRVKTNLPFKLKESTVR  
YSDFEWLRSELERESKPCRLMTSEARSHGRTWCAQNDEKLFC

Human SNX3 protein sequence - var3 (public gi: 15779012) (SEQ ID NO: 289)  
MAETVADTRRLITKPQNLNDAYGPPSNFLEIDVSNPQTGVGRGRFTTYEIRVKTNLPFKLKESTVR  
YSDFEWLRSELERESKVVVPLPGKAFLRQLPFRGDDGIFDDNFIEERKQGLEQFINKVAGHPLAQNERC  
LHMFLQDIEDKSYTPSKIRHA

Human SNX3 protein sequence - var4 (public gi: 3126979) (SEQ ID NO: 290)  
MAETVADTRRLITKPQNLNDAYGPPSNFLEIDVSNPQTGVGRGRFTTYEIRVKTNLPFKLKESTVR  
YSDFEWLRSELERESKVVVPLPGKAFLRHFPPRGDDGIFDDNFIEERKQGLEQFINKVAGHPLAQNERC  
LHMFLQDIEDKSYTPSKIRHA

Human SNX3 pray sequence - var1 (SEQ ID NO: 173)  
GCCGCATGGNAGTACCCATACGACGTACCAAGATTACGCTCATATGCCATGGAGGCCAGTGAAATTCCAC  
CCAAGCAGTGGTATCACCGCAGAGTGCCATTATGGCGGCGCGGGCTGAAACGGGAGGGGGCGG  
AGGGAGCCCGGGCGGCAGCAGCTACAGCGAAATGGCGAGACCGTGGCTGACACCCGGCGCTGAT  
CACCAAGCCGAGAACCTGAATGACGCCAACGGACCCCCCAGCAACTTCCCTGAGATCGATGTGAGCAAC  
CCGAAACGGTGGGGGTGG  
TTTCAAGCTGAAAGAATCTACTGTTAGAAGAAGATAACAGTGACTTTGAATGGCTGCGAAGTGAAATCAGA  
AAGAGAGAGCAAGGTGCTAGTCCCCNNNGCTCCCTGGGAAAGCGTTTTGCGTCAGCTCCTTTAGAGG  
AGATGATGGAATATTGATGACAATTGAGGAAAGAAAACAAGGGCTGGAGCAGTTATAAACAG  
GTCGCTGGTCATCCTCTGGCACAAACGAACGGTGTCTTCACATGTTTACANGATGAAATANTNGATA  
AAAGCTNTACTCCATCTAAACATGCCGAANTTGGCANAANGGCNAACGTGACTATTATG

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ATTGANAGCCCCNNNAAAANTCTANNTTNNCNTGCTNACAAAAGTGNNTAANTGCCTNANNACTAA  
CCTNNNTNCCNANTTNNTTGNNTGGNNNTNAAAAATNAT

Human SNX3 pray sequence - var2 (SEQ ID NO: 174)  
CCGCCATGGTAGTACCCATACGACGTACAGTATTACGCTCATATGGCCATGGCAGGCCAGTGAAATTCCA  
CCCAAGCAGTGGTATCAACGCAGAGTGGCATTATGGCCGGGGCAGGAGGGAGGCCAGCGCGCGCA  
GCAGCTACAGCGAAATGGCGAGACCGTGGTGAACCCGGGGCTGATCACCAAGCGCAGAACCTGAA  
TGACGCCCTACGAGCCCCCAGCAACTTCCCTGAGATCGATGTGAGCAACCCGCAAACGGTGGGGTCGGC  
CGGGGCCGCTTACCAACTTACGAAATCAGGGTCAAGAACAAATCTTCCCTATTTCAGCTGAAAGAATCTA  
CTGTTAGAAGAAGATACTAGTGAATTGGAATGGCTGCGAAGTGAATTAGAAAGAGAGAGCAAGGTCGTAGT  
TCCCGCTCCCTGGAAAGCGTTTGCCTCAGCTNCTTATAGGGGATGATGGAATATTGATGAC  
AATTATGAGGAAAGAAAACAAGGCTGGANCNTTATNAACAAGTNAAGTGTCTNCTATTCTNAAA  
GTGTANGACTNCNTTAAAGTACTACTTTNTTANATGTNAANMNAACTGNACTGTNNCNTTNTTNA  
CNTTCCCTANNTTNAATTNTTAA

Unigene Name: SRA1 Unigene ID: Hs.32587 Clone ID: 3GD\_19

Human SRA1 mRNA sequence - var1 (public gi: 10436964) (SEQ ID NO: 175)  
ACGTGAAGCCGGGTGAGCGCAGCCGGGGCTAGGGCACTAGGTGTCGCCCGGCCAGGCTGGGGCG  
GTTGCGGGCTTAGTATGGACCCCTCTGCTCTCCCCAGCCCCAGTATAAGCTAACAGTGGAGTCCGGGCT  
CGCTTCACACATCCCTCGCCTCCGAGGCAACAAGGAACGCGCTGGAACGACCCGCCAGTTCTCATA  
CGGCGTGCAGACCCAGGCCGGGACCCAGGCGCTCGCTTACCAAGAGGGTAGCCGCACCCAGGAT  
GGATCCCCAGAGTCCCCGATCAGAGACTTCTCTGGGCCTCCCCAATGGGGCCTCCACCTCCCTCAA  
GTAAGGTTCCCAAGTCCCCACCTGTGGGGAGTGGCTCTGGCTGGAGGCCACAAGTTCCCAGT  
CGAGCTGAGGCTGACTGATGGAGGATGTGCTGAGACCTTGGAACAGGCACTGGAAAGACTGCCGTGGC  
CACACAAGGAAGCAGGTATGTGATGACATCAGCCGACGCCCTGGCACTGCTGCAGGAACAGTGGGTGGAG  
GAAAGTTGTCATAACCTGAAAGAAGAGAATGGCTCTACTGGTCAAGAGCTTCAAGCCACCGGTGGGA  
CGCAGCAGATGACATCCACCGCTCCCTCATGGTTGACCATGTGACTGAGGTCAGTCAGTGGATGGTAGGA  
GTTAAAAGATTAATTGCAAGAAAAGAGGAGTCTGTTTCAGAGGAGGCCAGGCAATGAAAGAGAAATCTGCAG  
CCACAGCTGAGAAGAACCATACCATACCCAGGCTTCCAGGCCAGGCTTCAATACTCCGGTTCCCCAGACTCA  
CCGGACCATCCTCATGGGCTGACCCACCATGGGAGACCTTCTGTCATCTGGCTCCCTCTTACCAACCAAAGACTGT  
CCCACGGGCTGACCCACCATGGGAGACCTTCTGTCATCTGGCTCCCTCTTACCAACCAAAGACTCA  
TAACATGCAATTCAATAAAAACATCTCTGCGGTGGGCTTGGTAGGAGAGATGAACCCCTCCGGTGCCA  
AGCTAGTCCCCCTGTGGTGCCTCGACTGCCCTGCTGGTATCTGCAAACCTCTGTTCTCCCTCTC  
CATTGATCAGGAAGGGATCTGCTGGTAAAGTCAGACTACTGCCCTACCACCTTTCCAAAGTAGACTGA  
AACACACATCCGTGCTGGCGGAGCAGCTGTGTTGGATGGTTCAATTGAGCATGAGAACAGACTCAA  
TAGAACGGGGAGACTTICCTCAACAAAAGGAAGACAGTCTATTGACTGTATCACCCCTGAGATA  
CTACTGTTACAGAGATTAGAACACCACATTGAGTGGGTTCTGTGAAATCGAAGGAGAAAAAGACCAGA  
TTACTGAGATTGGGATTGTAACCTGACTTGCCAAACAAACTGCTGCCCTCAAAAAAAAAAAAAAA

Human SRA1 mRNA sequence - var2 (public gi: 9930611) (SEQ ID NO: 176)  
TCCTTTGGTGCCTTGTGACCAGGGCCCTGATGGTCATTAGATGGAGCCTCGAGTCTAGGGAGTTGCC  
GCAGGGTCCCCACAGCGGCTCCGACGGTTGTGAACCAAGCAGCATCCATCCTCACGGATCCGGCAACCCGC  
CTGGCCCTGGACGTGTCTCAACTGGCCCGGTGAGGGGGCGCCCGGAAATGACGCGCTGCCCGCTGGC  
CAAGCGGAAGTGGAGATGGCGAGCTGTGAGCGGGGCAACAAGGAACGCGGGCTGGAACGACCCGC  
CGCAGTTCTCATACGGGCTGAGACCCAGGCCGGGGACCCAGGCCAGGCGCTCGCTGCTTATCAAGAGGGTCGC  
CGCACCCCGAGGATGGATCCCCAGAGTCCCCGATCAGAGACTTCTCTGGGCCCTCCCCAATGGGGCT  
CCACCTCTCAAGTAAGGCTCCAGGTCCCCACCTGTGGGGAGTGGCTCTGGCTCTGGCTGGAGGCCA  
CAAGTTTCCAGTCAGTGTGAGGTGTGATGGAGGATGTGATGACATCAGCCGACGCCCTGGCACTGTCAGGAACAG  
CTGGCGTGGGCCACACAAGGAAGCAGGTATGTGATGACATCAGCCGACGCCCTGGCACTGTCAGGAACAG  
TGGGCTGGAGGAAAGTTGTCATAACCTGTAAGAAGAGAATGGCTACTGGTCAAGAGCTTCAAGCC  
ACCGGTGGACCGAGCAGCAGATGACATCCACCGCTCCCTCATGGTTGACCATGTGACTGAGGTCAAGTCAGTG  
GATGGTAGGAGTTAAAGATTAATTGAGAAAAGAGGAGTGTGTTTCAGAGGAGGCCAGCAATGAAGAG  
AAATCTGAGCCACAGCTGAGAAGAACCATACCATACCAGGCTTCCAGCAGGCCATATACTCCGGTTC  
CCGAGACT

Human SRA1 mRNA sequence - var3 (public gi: 9930613) (SEQ ID NO: 177)  
TCCTTTGGTGCCTTGTGACCAGGGCCCTGATGGTCATTAGATGGAGCCTCGAGTCTAGGGAGTTGCC  
GCAGGGTCCCCACAGCGGCTCCGACGGTTGTGAACCAAGCAGCATCCATCCTCACGGATCCGGCAACCCGC  
CTGGCCCTGGACGTGTCTCAACTGGCCCGGTGAGGGGGCGCCCGGAAATGACGCGCTGCCCGCTGGC  
CAAGCGGAAGTGGAGATGGCGAGCTGTGAGCCGGCAACAGGAACGCGGGCTGGAACGACCCGC

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CGCAGTTCTCATACGGGCTGCAGACCCAGGCCGGGACCCAGGCCTCGCTGCTTACCAAGAGGGTAGC  
CGCACCCCCAGGATGGATCCCCAGAGTCCCCGATCAGAGACTTCTCTGGCCTCCCCAATGGGCCT  
CCACCTCTTCAGTAAGGCTCCAGGTCCCACCTGTGGGAGTGGTCTGGCCTCTGGCGTGGAGCCA  
CAAGTTCCCAGTCAGCTGAGGCTCGACTGATGGAGGATGTGCTGAGACCTTGGAACAGGCATTGGA  
AGACTGCCGTGCCACACAAGGAAGCAGGTATGTGATGACATCAGCCGACGCCACTGCTGCAGGAA  
CAGTGGCTGGAGGAAAGTTGTCATAACCTGTAAAGAAGAGAATGGCTACTGGTCAAGAGGCTTCAA  
GCCACCGGTGGGAGCAGCAGATGACATCCACCGCTCCCTCATGGTACCATGTGACTGAGGTCA  
GTGATGGTAGGAGTTAAAGATTAATTGCAAGAAAAGAGGAGTGTGTTTCAGAGGAGGCAGCCAATGAA  
GAGAAATCTGCAGCCACAGTGTGAGAACCATACCATAACCAAGGCTTCAGCAGGCTTCATAATCCTCGG  
TTCCCCAGACT

Human SRA1 mRNA sequence - var4 (public gi: 4588026) (SEQ ID NO: 178)  
CGCTTGGCGGAGCTGTACGTGAAGCCGGCAACAAGGAACAGCGGCTGGAACGACCCGCCAGTCTCAT  
ACGGGCTGCAGACCCAGGCCGGGACCCAGGCCGCTCGCTGCTTACCAAGAGGGTAGCCGACCCAGGA  
TGGATCCCCAGAGTCCCCGATCAGAGACTTCTCTGGCCTCCCCAATGGGCCTCCACCTCTTCA  
AGTAAGGCTCCAGGTCCCCACCTGTGGGAGTGGTCTGGCCTGGCGTGGAGGCCACAAGTTCCCAG  
TCGAGTCTGAGGCTGTGATGGAGGATGTGCTGAGACCTTGGAACAGGCACTGGAAAGACTGCCGTGGCCA  
CACAAGGAAGCAGGTATGTGATGACATCAGCCGACGCCCTGGCACTGCTGCAGGAACAGTGGCTGGAGGA  
AAGTTGTCATAACCTGTAAAGAAGAGAATGGCTACTGGTCAAGAGGCTTCAAGCCACCGTGGGACG  
CAGCAGATGACATCCACCGCTCCCTCATGGTACCATGTGACTGAGGTCACTGGATGGTAGGAGT  
TAAAAGATTAATTGCAAGAAAAGAGGAGTGTGTTTCAGAGGAGGCAGCCAATGAAGAGAAATCTGCAGCC  
ACAGCTGAGAAGAACCATACCATAACCAAGGCTTCAGCAGGCTTCATAATCCTCGGTCCCCAGACTCACC  
GGACACCATCTCTATGCCCTGGAGACCTTCTGTCACTTGGCTCCCTTACCAACCAAGACTGTCC  
CACTGGCCTGACCCACCTATGAGGGAAAGAACCTCCACCTGGGCCAGAGGGAGTTCATGTGTTACTCATA  
ACATGCATTCAATAAAACATCTGCGGTGGT

Human SRA1 mRNA sequence - var5 (public gi: 25123254) (SEQ ID NO: 179)  
GGCGGAGCTGTACGTGAAGCCGGCAACAAGGAACAGCGGCTGGAACCCGCCAGTCTCATACGGGCT  
GCAGACCCAGGCCGGGAGCCAGGCCGCTCGCTGCTTACCAAGAGGGTCCGGCACCCAGGATGGATCC  
CCCAGACTCCCCGATCAGAGACTTCTCTGGGCTCCCCAATGGGGCTCCACCTCTTCAAGTAAGG  
CTCCAGGTCCCCACCTGTGGGAGTGGTCTGGCCTGGCGTGGAGGCCACAAGTTCCCAGTCAGTC  
TGAGGCTGTGATGGAGGATGTGCTGAGACCTTGGAACAGGCACTGGAAAGACTGCCGTGGGCCACAAAGG  
AAGCAGGTATGTGATGACATCAGCCGACGCCCTGGCACTGCTGCAGGAACAGTGGCTGGAGGAAAGTTGT  
CAATACCTGTAAAGAAGAGAATGGCTACTGGTCAAGAGGCTTCAAGCCACCGTGGGACGCAGCAGA  
TGACATCCACCGCTCCCTCATGGTACCATGTGACTGAGGTCACTGGGATGGTAGGAGTTAAAAGA  
TTAATTGCAAGAAAAGAGGAGTGTGTTTCAGAGGAGGCAGCCAATGAAGAGAAATCTGCAGCCACAGCTG  
AGAAGAACCATACCATAACCAAGGCTTCAGCAGGCTTCATAATCCTCGGTCCCCAGACTCACCGGACACC  
ATCTCCTATGCCCTGGAGACCTTCTGTCACTTGGCTCCCTTACCAACCAAGACTGTCCCACGTGG  
CTGACCCACCTATGAGGGAAAGAACCTGGGCCAGAGGGAGTTCATGTGTTACTCATAACATGCA  
TTCAATAAAACATCTGCGGTGAAAAA

Human SRA1 mRNA sequence - var6 (public gi: 18027813) (SEQ ID NO: 180)  
GCAGGCACTAACGCTGGGCACTGGGAATGTAATAAAATAGTCAGGTCCCACCTCTAACAGACTGCCGACA  
GGGAAACGAACAAGAGTCAAATAAGGAGAAGATGTGATGTAATAACACCTACGAAATCTCAGAGGGTTGT  
AGGGCTGCTGGGAGCTCAAGTGGAGACACTTAACCTGGCCTGAGACATTCAGAAGGCTCCTGAAGAACTG  
ACATCTGAACTGAGAACTGAAGGAAGATGAGTACTAGTGAGGCTACCGGACGTGAATGTGGAGATTGTG  
AGGGCAATGCAAGAGGAGGCTGTAGAAGTCACCTGGCTAGATCACAGCGGGTGTATGTGGGCCAGGAG  
CTTCTTGTGAATTGCTCTGAGAGGATGAGGCTCCTAGAGCACTGGCTCTGGACAGCAACCTCC  
TTTGGTGCCTTGTGACCAAGGGCCCTGATGGTCATTAGATGGGCTTCAGTCTTAGGGAGTTGCCGCA  
GGGTCCCCACAGCGGCTCCCGACGGTTGTGAACCAAGCATCCATTCTCCACGGATTCCGGCAACCCGCC  
GCCCTGGACGTCTCAACTGGCCCGCTGAGGGGCCGCCCCGAAATGACCGCTGCCCCGCTGGCCAA  
GCAGGAAGTGGAGATGGCGAGCTGTACGTGAAGCCGGCAACAAGGAACGCCAGTGAACGACCCGCC  
AGTCTCATACGGCTGCAAGACCCAGGCCGGGACCCAGGCCCTCGCTGCTTACCAAGAGGGTAGCCGC  
ACCCAGGATGGATCCCCAGAGTCCCCGATCAGAGACTTCTCTGGCCTCCCCAATGGGCCTCCA  
CCTCTTCAAGTAAGGCTCCAGGTCCCCACCTGTGGGAGTGGTCTGGCCTCTGGCGTGGAGGCCACAA  
GTTCCCAGTCAGCTGAGGCTCGACTGATGGAGGATGTGCTGAGACCTTGGAACAGGCACTGGAAAGA  
CTGGCGTGGCCACACAAGGAGCAGGTATGTGATGACATCAGCCGACGCCCTGGCACTGCTGCAGGAACAG  
TGGCGTGGAGGAAAGTTGTCATAACCTGTAAAGAAGAGAATGGCTACTGGTCAAGAGCTTCAAGCC  
ACCGGTGGGACCGAGCAGATGACATCCACCGCTCCCTCATGGTACCATGTGACTGAGGTCACTGAGTG  
GATGGTAGGAGTTAAAGATTAATTGCAAGAAAAGAGGAGTGTGTTTCAGAGGAGGCCAATGAAGAG  
AAATCTGCAGCCACAGCTGAGAACCATACCATAACCAAGGCTTCAGCAGGCTTCATAATCCTCGGT  
CCAGACTCACCGACACCCTCTCATGCCCTGGAGACCTTCTGTCACTTGGCTCCCTTACCAACCA

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CCAAGACTGTCCACTGGGCTGACCCACCTATGAGGAAGAAGTCCCACCTGGGCAGAGGGAGTTCAT  
GTGTTACTCATAACATGCATTCAATAAAACATCTCTGCGGTGAAAAAAAAAAAAAAA

Human SRA1 mRNA sequence - var7 (public gi: 16549596) (SEQ ID NO: 181)  
TTATAGCAAATCAGTGCAATAAAATCCCTCAGTGACCTCACTGGATGTGAGTATATTGGGCTGGGA  
CAGGGCTGGGCTAACACCCCTGTGAGATGAGTGTCTTGTGCTGTGCTTGATGTTGGTGGCTCT  
GTAGTCACATGACAGCATGGGTGTGATGGAGATCTGACTTCATTCAACAAACATATTCTAAGGAGTT  
CCTGTGCCAGGCACTAAAGCTGGGCACTGGGAATGTAATAAAATAGTCAGGTCCACCTCTAAGACTGT  
CCGACAGGAAACGAACAAGACTCAAATAAGGAGATGAGTGTGATGTAATAACACCTACGAAATCTCAGAG  
GGTGTAGGGCTGTGGGAGCTCAAGTGAGACACTTAAACCTGGCCTGAGACATTCCAGAAGGCTCTGAA  
GAACTGACATCTGAACACTGAGAAGATGAGTACTAGTGAGGCTACCGGACGTGAATGTGGAGA  
TTGTGCAGGGCAATGCAAGAGGAGCTGTAGAAGTCACCTGGCTAGATCACAGCAGGGTGTATGTGGGG  
CAGGAGCTTCTTGTGCTCTGAGAGGATGAGGCTCCTAGAGCACTGGCTCTGGACAGCA  
ACCTCTTGTGCTGTGACCAGGGCTCTGATGGTCAATTAGATGGAGCCTCGAGTCTTAGGGAGTT  
GCCGAGGGTCCCCACAGCGGCTCCGACGGTTGTGAACCAGCATCCATTCTCACCGATTCCGCAACC  
CGCCTGGCCCTGGACGTGTCACACTGGCCCGCGTGAGGGGGCGCCCGAAATGACCGCTGCCCCGCT  
GGCCAAGCGGAAGTGGAGATGGCGAGCTGTACGTGAAGCGGGCAACAAAGGAACCGGCTGGAACGACC  
CGCCGAGTCTCATACGGCTGCAAGACCCAGGCCGGACCCAGGCGCTCGTGTACCAAGAGGGT  
AGCCGACCCAGGATGGATCCCCAGAGTCCCCCATCAGAGACTTCTCTGGGCTCCCCAATGGGG  
CCTCCACCTCTTCAAGTAAGGCTCCAGGTCCCCACCTGTGGGGAGTGGTCTGCGCTCTGGCGTGGAGC  
CCACAAGTTCCCAGTCAGTGTGAGCTGACTGATGGAGATGTGCTGAGACCTTTGAAACAGGCATT  
GGAAGACTGGCTGGCCACACAAGGAAGCAGGTATGTGATGACATCAGCCGACGCTGGACTGCTGAG  
GAACAGTGGCTGGAGGAAGTTGTCAATACCTGAAAGAAGAATGGCTCTACTGGTGCAAGAGCTTT  
CAAGCCACCGGTGGAGCAGCAGATGACATCCACCGCTCCCTATGGTTGACCATGTGACTGAGGTAG  
TCAGTGGATGGTAGGAGTTAAAGATTAATTGCAAGAAAGAGGAGTCTGTTTCAGAGGAGGAGCCAAT  
GAAGAGAAATCTGCAGCCACAGCTGAGAAGAACATACCATACCAGGCTCCAGCAGGCTTCATAATCCT  
CGGTTCCCCAGACTCACGGACACCATCCCCATGCCTGGAGACCTCTGTCACTGGCTCCCCCTTA  
CCACCAAGACTGTCCACTGGGCTGACCCACCTATGAGGAAGAAGTCCCACCTGGCCAGAGGGA  
GTTCATGTGTTACTCATAACATGCATTCAATAAAACATCTGCGGTGGGCTTGGTAGGAGAGATG  
AACCTTCCGGTGCACAGTGTGCTGGTAAAGTCAGACTACTGCCTACCAACTTT  
TCCAAAGTAGACTGAAAGCACATCTGTGCTGGCGGAGCAGCTGTGTTGGATGGTTCAATTGCA  
TGAGAACAGACTCAAATAAGAACGGGAGACTTTCCCTCAACAAAAGGAAAGACAGTCCTATTGCA  
TATCACCCCTGAGATACTACTGTTACAGAGATTAGAAC

Human SRA1 mRNA sequence - var8 (public gi: 9930609) (SEQ ID NO: 182)  
TCCCTTGGTGCCTGTGACCAGGGCCCTGATGGTTCAATTAGATGGAGCCTCGAGCTTAGGGAGTTGCC  
GCAGGGTCCCCACAGCGGCTCCGACGGTTGTGAAACAGCATCCATCCTCACGGATTCCGGCAACCCGC  
CTGGCCCTGGACGTGTCACACTGGCCCGCGTGAGGGGGCGCCCGAAATGACCGCTGCCCCGCTGGC  
CAAGCGGAAGTGGAGATGGCGAGCTGTACGTGAAGCGGGCAACAAAGGAACCGGCTGGAACGACCCGC  
CGCAGTTCTCATACGGGCTGCAAGCAGGCCAGGCCGGACCCAGGCGCTCGTGTACCAAGAGGGTAGC  
CGCACCCCCAGGATGGATCCCCAGAGTCCCCGCATCAGAGACTTCTCCTGGGCTCCCCAATGGGGCCT  
CCACCTCCTCAAGTAAGGCTCCCAGGTCCCCACCTGTGGGGAGTGGTCTGCGCTCGGTGGAGGCCA  
CAAGTTCCCAGTCAGTGTGAGGCTGTGATGGAGGATGTGCTGAGACCTTTGAAACAGGCAATTGGA  
CTGCCGTGGCCACACAAGGAAGCAGGTATGTGATGACATCAGCCGACGCGTGGACTGCTGAGAACAG  
TGGGCTGGAGGAAGTTGTCAATACCTGTAAGAAGAGAATGGCTCTACTGGTGCAAGAGCTTCAAGCC  
ACCGGTGGGACCGCAGCAGATGACATCACCAGCTCCCTCATGGTTGACCATGTGACTGAGGTCA  
GATGGTAGGAGTTAAAGATTAATTGCAAGAAAGAGGAGTGTGTTTCAGAGGAGGCCAATGAAGAG  
AAATCTGCAGCCACAGCTGAGAACATACCATACCAGGCTCCAGCAGGCTTCATAATCCTCGGTT  
CCCAGACT

Human SRA1 protein sequence - var1 (public gi: 9930610) (SEQ ID NO: 291)  
MTRCPAGQAEVEMAELYVKPGNKERGWNDPPQFSYGLQTQAGGPQRSLLTKRVAAPQDGSPRV  
PASETSP  
GPPPMGPPPPSSKAPRSPPVGSGPASGVPEVSEAVMEDVLRPLEQALEDCRGHTRKQVCDDISRR  
LALLQEWA  
QEQWAGGKLSIPVKRMALLVQELSSHWRDAADDIHRSLMVDHVTEVSQWMVGVKRLIAEKRS  
LFS  
EEANEEKSAATAEKNHTIPGFQQAS

Human SRA1 protein sequence - var2 (public gi: 25123255) (SEQ ID NO: 292)  
MGPPPPSSKAPRSPPVGSGPASGVPEVSEAVMEDVLRPLEQALEDCRGHTRKQVCDDISRR  
LALLQEWA  
QEQWAGGKLSIPVKRMALLVQELSSHWRDAADDIHRSLMVDHVTEVSQWMVGVKRLIAEKRS  
LFS  
EEANEEKSAATAEKNHTIPGFQQAS

PCT/US04/06308

Human SRA1 protein sequence - var3 (public gi: 9930614) (SEQ ID NO: 293)

MTRCPAGQAEVEMAELYVKPGNKERGWNDPPQFSYGLQTQAGGPRRSLLTKRVAAPQDGSPRVPASETSP  
GPPPMGPPPPSSKAPRSPPVGSGPASGVEPTSFVSEARLMEVLRPLEQALEDCRGHTRKQVCDDISR  
RLALLQEQQWAGGKLSIPVKKRMALLVQELSSHRWAADDIHRSLMVDHVTEVSQWMVGVKRLIAEKRSLF  
SEEAAANEKSAATAEKNHТИPGFQQAS

Human SRA1 protein sequence - var4 (public gi: 9930612) (SEQ ID NO: 294)

MTRCPAGQAEVEMAELYVKPGNKERGWNDPPQFSYGLQTQAGGPRRSLLIKRVAAPQDGSPRVPASETSP  
GPPPMGPPPPSSKAPRSPPVGSGPASGVEPTSFVSEAVMEDVLRPLEQALEDCRGHTRKQVCDDISR  
LALLQEQQWAGGKLSIPVKKRMALLVQELSSHRWAADDIHRSLMVDHVTEVSQWMVGVKRLIAEKRSLF  
EEAANEKSAATAEKNHТИPGFQQAS

Unigene Name: SYNE1 Unigene ID: Hs.416719 Clone ID: 3GD\_138aa2938

Human SYNE1 mRNA sequence - var1 (public gi: 21753084) (SEQ ID NO: 183)

GTACAAAAACGAACCTTTACAAAATGGATCAACTCTCATCTGCCAACGCCAAACCTCCAATGGTGGTGG  
ACGATCTTTTGAAAGACATGAAAGATGGTAAACTGCTTGCCTTCTGGAGGTCTGTCTGGCAGAA  
ACTGCCCTGTGAACAAGGACGCCGATGAAGCGAACCCATGCTGTGGCTAACATTGGCACGGCACTCAAG  
TTCCCTGAAGGAAGAAAGATTAAATTAGTCACACATTAACCTCCACCGATATAGCTGATGGCGACCCCTCAA  
TAGTTCTGGATTGATGTGACCATTATCTATATTCCAGATTGAAGAGTTGACCCAGCAACCTGCCCA  
GCTCAGTCCTTGTCCAGCAGCGCATCCTCGTGGACAGCATAGTTAGCTCTGAGACTCCAGCCCACCA  
AGTAAACGGAAGGTGACCCACCAAGATCCAAGGAAATGCTAAGAAGGCTTATTAAAGTGGGTCAGTACA  
CAGCTGGCAAGCAGACTGGAATAGAAGTAAAGATTGGAAAGAGTTGGAGAAGCCGGTTGCCCTTCA  
TTCAGTTATTGATGCCATTGACCGGAATTGGTGGACTTGGAGACAGTGAAGGCACTTCAACCGAGAA  
AATTGGAGGATGCTTCACTATCGTGAACAGAACAGATGGGATCCAAAGAGACTGCTAGATCCTGAAGACG  
TTGATGGATAAACAGATGAGAAATCTATTATGACCTATGTAGCCCAGTTCTGAAACATTATCCTGA  
CATCACAATGCAAGCACTGATGGCAAGAGGATGATGAAATACTTCCAGGTTCCATCTTGCAAAAT  
TCTGTACAAAATTAAAGAGAGAAGACAGAGTAATTAAAGGAAATGAAAGTTGGATAGAACAAATTG  
AGAGAGATTGACAAGAGCACAGATGGTGGAAATCAAATTACAGGATAAATATCAGTCATTAAAGCACTT  
CAGAGTTCAATATGAAATGAAGAGGAAACAGATTGAAACATTAAACAAACATTACACAGAGACGGTAA  
TTGTCACTTGACCAAGCATTGGTAAACAAATCTGGGATAGAGTGAACCTCCAGGCTTTGACTGGCATA  
TACAGCTTGATAAACTCTTCCCTGCACCTCTGGCACCATAGTGCCTGGCTGTACAGAGCGGAGGTGGC  
CCTGAGAGAGGAATAACCGTTCAACAGGTCCACCGAGGAACAGCAACACCGATACAACGGAAACTTGAG  
CAACATAAGGATCTGCTTCAAAACACGGATGCCACAAAAGAGCATTCCATGAAATCTACCGGACAGGT  
CTGTTAACGGGATTCCAGTGCACCTGATCAATTAGAGGACATGGCGAGAGGTTCTATTGTTCTC  
CACATCAGAGCTACACCTAATGAAATTTAGAATTAAAGTAAAGTACCGCTCTGCTCACTGCTGGTT  
CTTGAGAGCTCAAGCTGAAGTCTGGATCATTAAGTACGGGAGGAGAGTCAGTGGAGCAGCTCTAC  
AAAATACGTGTTTATAGAAAATAGCAAGTCTTGAACAAATATGAGGTGACATACCAGATCTTGA  
ACAGACAGCTGAGATGTATGCTAAAGCAGATGGTCAGTGGAGAAGCTGAGAATGTGATGAAATTGATG  
AATGAAACACCAGCTCAGTGGAGGAATCTCTCAGTAGAAGTGAAGGAGTGTGAGGAGCATGCTGGAAAG  
TGATCTCTAACTGGGATCGTATGGCAATACAGTGGCTAGTCAGTGCAGCCTGGCTAGAGGATGCTGAAAA  
AATGCTCAATCAATCAGAAAATGCCAAAAGGATTTTCTGAAATTACCTCATTGATTAGCAGCAT  
ACTGCCATGAACGATGCTGCCATTCTAAATTGAAACCTGTGATGAGATGGTTCCGTGACCTGAAGC  
AGCAATTACTGTTCTAAATGGCGGTGGAGGGAGTTGTTATGGAAGTCAGCAAGCAATATGCTCAAGCTGA  
TGAGATGGACAGAATGAAGAAGGAATACACAGACTGTGTTTACCTCTGCTGCCTTGCAACGGAAAGCC  
CATAGAAAATCTGAACCCCTAGAAGTCTCTTATGAATGTCAAGCTATTAAATCAAGACTTGGAGG  
ATATTGAGCAGAGGGTGCCTGTGATGGATGCCAATACAAGATAATTACAAAGACAGCACACCTCATTAC  
CAAAGAAAGCCCC

Human SYNE1 mRNA sequence - var2 (public gi: 22382201) (SEQ ID NO: 184)

AGCGGCTGCCCTCTTGTGAGTGTGCAAAGGCCCTGGAAATTCTATTATGACAGAAATAGATCTAGAAAAGT  
CCAAGCATGTTTCTAGAGTGGTGTAGCCCTGTGCTGCCCTCCAGTGAAGAGTCTCTGGTGTGGCTTC  
TGCTTCCGGAGGGACCATGCCAACCTCCAGAGGGCCTCCCGTGTCTGGATATGCCAATGTGATG  
CAGAGGCTGCAAGATGAGCAAGAGATAGTACAAAACGAACCTTCAACAAATGGATCAACTCTCATCTGG  
CCAAGCGAAAACCTCCAATGGTGGTGGACGATCTTGAAGACATGAAAGATGGTTAAACTGCTTGC  
CCTCTGGAGGTCCGTCTGGCAGAAACTGCCTGTGAACAAGGACGCCGATGAAGCGAATCCATGCT  
GTGGCTAACATGGCACGGCACTCAAGTCTCTGAGAAGGAAAGATTAAATTAGTCACACATTAACCTCA  
CCGATATAGCTGATGGCCGACCCCTCAATAGTCTGGATTGATGTGGACCATTATTCTATATTCCAGAT

TGAAGAGTTGACCAGCAACCTGCCAGCTCCAGTCTTGTCAGCAGCGCATCCTCCGTGGACAGCATA  
GTTAGCTCTGAGACTCCCAGCCAACAAGTAAACCGAAGGTCAGCACAGCTGGCAAGCAGACAGCTGGAAATAGAAGTAAAAGATTTGGGAA  
AGGCTTTATTAAGTGGGTTCAAGTACACAGCTGGCAAGCAGACAGCTGGAAATAGAAGTAAAAGATTTGGGAA  
GAGTTGGAGAAGCGGGGTTGCCTTCAAGTATTCACTGCACCTCGACCGGAATTGGTGGACTTGGAG  
ACAGTGAAGGAGATCCAACCGAGAAAATTGGAGGATGCTTCACTATGCCGAAACAGAACAGACTGGGAA  
TCCCAAGACTGCTAGATCCTGAAGACGTTGATGTCAGATAAACAGATGAGAAAATCTATTATGACATATGT  
AGCCAGTTCTGAAACATTATCCTGCACATCCACAATGCAAGCAGCTGATGGGCAAGAGGATGATGAAATA  
CTTCAGGTTCCCATCTTTGCAAATTCTGTACAAAATTAAAGAGAGAACAGAGCTAATTTAAGG  
AAATGAAAGTTGGATAGAACAAATTGAGAGAGATTGACAAGAGCACAGATGGTGAATCAAATTACA  
GGATAAAATATCAGTCATTTAACGACTTCAGAGTTCAATATGAAATGAAGAGGAAACAGATTGAACATTAA  
ATACAACCATTACACAGAGACGGTAAATTGTCAGTACCAAGCATTGGTAAAACAATCTGGGATAGAG  
TGACCTCCAGGCTCTTGACTGGCATATACAGCTTGATAAAATCTTCCCTGCACCTCTGGCACCATTAGG  
TGCCGGCTGTACAGAGCGAGGTGGCCTGAGAGAGGAAATAACCGTTCAACAGGTCACGGAGGAAACA  
GCAAACACGATAAACGAAACTTGAGCAACATAAGGATCTGTTCAAAACACGGATGCCACAAAAGAG  
CATTCCATGAAATCTACCGGACCAGGCTGTTAACGGGATTCCAGTGCCACCTGATCAATTAGAGGACAT  
GGCCGAGAGGTTTCATTTGTTCTCACATCAGAGCTACACCTAATGAAAATGGAATTTTAGAATTAA  
AAGTACCGCTCTGCTTACAGCTGCTTCTGAGACTCAAAGCTGAAGTCTGGATCATTAAGTACGGGAG  
GAGAGACTGAGGAGCAGCTTCAACAAAATACGGTGTCTTATAGAAAATAGCAAGTTCTTGAAACAA  
TATGAGGTGACATACCGAGTCTGAAACACAGACTGAGATGTATGTCAAAGCAGATGGTCACTGGAG  
AAGCTGAGAATGTGATGAAATTCAATGAAACCCACCGCTCAGTGGAGGAATCTCTCAGTAGAAGTGA  
GAGTGTAGGAGCATGCTGAAAGAAGTGTCTAACTGGGATCGCTATGGCAATACAGTGGCTAGTCTG  
CAAGCCTGGCTAGAGGATGCTGAAAAAAATGCTCAATCAATGAGAAAATGCCAAAAGGATTTTCGAA  
ATTACCTCATTGGATTGAGCAGCATACTGCCATGAACGATGCTGGCAATTCTAATTGAAACCTGTGA  
TGAGATGGTTCCCGTGACCTGAAGCAGCAATTACTGTTGCTAAATGGCGGTGGAGGGAGTTGTTATG  
GAAGTCAAGCAATATGCTCAAGCTGATGAGATGGACAGAATGAAAGAAGGAATACACAGACTGTTGTTA  
CCCTGTCTGCTTGTGCAACGGAAGCCCATAAGAAAATTCTGAAACCTTCTGAGGTCTCTTATGAAATGT  
CAAGCTATTAAATTCAAGACTTGGAGGTGAGGGGTTCTGAAATCAAATGAAAAGCCTACTCTGTTGAG  
AGGAAAGATCAGCAAGTTTATTGAGATCATTGAAAGCTGTTCTGTCACCTGCAAGAAAAAAATGATTGAC  
ATGTCCTGATGTCCTAACATTGACACCTGTCAGAAAAAAATGATTGAACATAAAAAGACATGACTTGATC  
ATATAAAAGTAACCTCAAAATTGTTAAAAAAAAAGAAAAAAAAAA

Human SYNE1 mRNA sequence - var3 (public gi: 28192627) (SEQ ID NO: 185)  
AGTACCGGGAGCTTAAACGGAAGAAGAAAAAGAAGCAGTCAGTCTTGGAGAGCTGCCCTCTGT  
TGACTGCTGCAAAGGCCCTGGAATTCAATTGACAAATAGATCTAGAAAAGTCAAGCAGATTTCTAG  
AGTGGTGTAGCCCTGTGCTGCCCTCCAGTGAAGAGTCTCTGGTGTGGCTCTGCTTCCGGAGGGACCA  
TGGCACCTCCAGAGGGCCTCCCGGTGCTCTGGGATATGCCAATGTCATGTCAGAGGCTGCAAGATGA  
GCAAGAGATAGTACAAAACGAACTTCACAAAATGGATCAACTCTCATCTGCCAAGCGGAAACCTCCA  
ATGGTGGTGGACGATCTTTGAAAGACATGAAAGATGGTGTAAACTGCTTGGCCTTCTGGAGGTCTGT  
CTGGGAGAAAACGCTTGTGAAACAAGGACGCCGATGAAGCGAATCCATGCTGTGGCTAACATTGGCAC  
GGCACTCAAGTCTCGAAGGAAGAAAAGATTAATTAGTCACACATTAACTCCACCGATATAGCTGACGGC  
CGACCCCTCAATAGTCTGGATTGATGTCAGGACATTATTCTATATTCCAGATTGAAAGAGTTGACCGACA  
ACCTGCCCCAGCTCCAGTCTTGTCCAGCAGCGCATCCTCCGTGGACAGCATAGTTAGCTCTGAGACTCC  
CAGCCCACCAAGTAAACGGAAGGTGACCCACCAAGGAAATGCTAAGAAGGCTTATTAAAGTGG  
GTTCACTGACAGCTGGCAAGCAGACTGGAAATGAAAGTAAAAGATTTGGGAGAGTTGGAGAAGCGGGG  
TTGCTTCAITCAGTTATCATGCCATTGACCGGAATTGGTGGACTTGGAGACAGTGAAGAGGAGATC  
CAACCGAGAAAATTGGAGGATGCTTCACTATGCCAAACAGAAACTGGGATCCCAAGACTGCTAGAT  
CCTGAAAGACGTTGATGGTGGATAAAACCGAGATGAGAAAATCTATTGACCTATGTCAGCCAGTTCTGAAAC  
ATTACCTGACATCCACAAATGACAGCACTGATGGCAAGAGGATGATGAAATACTCCAGGTTCCCATC  
TTTGCAAAATTCTGTACAAAATTAAAGAGAGAAGACAGAGTAATTGAAAGGAAATGAAAGTTGGATA  
GAACAATTGAGAGAGATTGACAAGAGCACAGATGGGAATCAAATTACAGGATAAAATTCAGTCAT  
TTAACGACTTCAGAGTTCAATATGAAAGAGGAAACAGATTGAAACATTAAATACAACCAATTACACAG  
AGACGGTAAATTGTCATTGACCAAGCATTGGTAAAACAATTCTGGGATAGAGTGAACCTCCAGGCTTT  
GACTGGCATATACAGCTGATAAAATCTCTCCTGCACCTCTGGGACCCATAGGTGCCTGGCTGTACAGAG  
CGGAGGTGGCCCTGAGAGAGGAAATAACCGTTAACAGGTCCACGAGGAAACAGCAAACAGATAACACG  
GAAACTTGAGCAACATAAG

Human SYNE1 mRNA sequence - var4 (public gi: 21734187) (SEQ ID NO: 186)  
GGGACACAGTGAGAAACCACTGATGAAAGTGTGTTGGGCTCAGATGGCAGTGTGGTGGCAGGACACACAA  
GCAGGGCAACAAAGCCGGAGTCCTGGGAGAGACTTCGGGAAGGAAAGAAACCATGGAGCAGAGTCCAGAGGGT  
GAATCGCAGTTGGTCAGGTGGCTCGGAAGTGTCTAGAGGAAGGAAAGGAGGGAGCCTCCCTGCTTGT  
GATTGGCTGGCTTTGATCATGGCAGTTGTCTGGAAATGACAGGATGGAATGGACAAAGTGGAGA  
AGAGCCTGGCTGTGAAGCAGCCGTTAACATGGAAAAGAGCTGTTGGCTCTATCCTGAAGGTCGTGGAG

CCACAGCAGGATCTGCCGGAGGGAGGTGCTGGATCCTCCCTCCTCAGGGATGTGCAGATTTCATATTGT  
ATCTTCTGGATACCACAGGGAGAAGGGATATTCCGGCGAGAGAGACCAAATGAAACCTTTACAACCT  
CAGACAGAAGTAGGGTGGTGGCTAAACTAGGGGAAGCAGAAATTGGGAATGGGAGAATGGGAATGATGT  
GAGAAATCACATAGAGAAGACTCCTCCAGAACACTCTCAGTCCATTGAACGGGATGGAGGCGATTTCCTGG  
GCTGGGCATCTGGTAAAGATGCAGGTGGCTCAGGCCCTGAGGACCAAGAGGGAAAGGAGCAGTGTG  
GGTCAGGTGGCAAGGGAGGTGGGCTGTGAGAGCAGGGAGGGATGAGTTGCTTGTGCATCCTGA  
TCTTGAGATACTGCAGAAATATCCAATGCAAAGATCCTCAGTCAGTGTAGATGCACGGTGTGAAGTGCAGAAC  
CAGAAATGCGAGATTGGTAGGTATTCAATGTAAATGGCAATGGTCTGGAGTGAACGGAGGAGCTCCCA  
CAGGAAGAGTGTGAGAGAAAACAAGAAGGACCAACCAAGCCACATGCAGTGAACGGATGGACA  
GAGAAACAGAAACTCTGTAAGGAAGGTGAATAAAATAGAATAAAGAGTTGGAGGCTGATTGTGGCACT  
TGGAAATGTATCTCATACATTCTGCAAGGACATCTGGGAATTCTGTTGGTTCTGGTGGTCACAT  
CAGATTCCAAGGGATGACACTGTTCTAAAAGAAAATGATTCTCATTTCTATTGTCTTACAGT  
AAGGCCTATTAGTCAGGCATATGGCATCTGAAGCAGAGCTGCCAAACAGCCACTGCCAGTTGGAC  
TGTGAGCTGAGATGGACTGTGCAAATTGAGATGGGTTGCGTGGAAACATGCTTACATGAATT  
CAAAGACTTAGACAAGAAGAAAATAAATATAAATTATATTGATTACATGTTATAATCCCTGTCT  
AATGTAGTGTAAATTAAATTTTATAAGTTCTTACATTCTAATGTTGCTACGGAAACCTTTAAGAT  
TACATATATAGTTACATAGAAATATGGGACAGCGCTGCTGGAGTCTGGCTGAAATCTCAGTTCT  
GCCATGTACTTCTGTTAAACTTAGATAAGGAACCTAATTCTCTGTGCTCAGTTCTCATATAA  
AATGGGAATAACATTCCCAGTACCTTATAGGGTTCTATGTTGATAAAATTGTGCTCAGACCAGCCTG  
GCTCATAAAAAACACTCTCAGTCAGTCACTGAGTTCTTTTTTTTTTTTTTTGAGACGA  
AGTCAGTTCTGTTGCCAGGCTGGAGTGCAGTGGCACAATCTGGCTCACTGCAACCTCCGCCCTCC  
GTTCAAGCGATCCTCGCTCAGCTCCCAGTGTAGCTGGGATTACAGGTACCTGTCACCACACTGGCT  
AATTGGTATTAGTAGAGATGGGTTCCACCATGTCGCCAGGCTGGCTCGAATTCTGACCTCA  
GGTGTACCCCGCTTGGCTCCAAAGTGTGGGATTACAGCGTGGAGCCACACGCCAACCCACTG  
TGAATTCTTATGATTCAATTCAAGGAAAGCTTGGTGGAGCCTGACGCTCCTCTGTGCGCTCAGGAGCTAT  
GTGCTAGAATAACTGACTTCTTTTCCCTAGGAAAGTTATTCTCGCACAAGGGATTAGGGT  
TTCCAGAACTTAGCTGCAACTTAGACTGTGTTTTTGCAAGATGTAATGATCCCCGAGAGCCTGAGG  
CCTATGTAACACTCACAGAAAATGCAATCAAATACTCCCGTAGGCACAACAGCCGGAGCCAGCCTC  
CCTCCCTCCCCGTAGAGCAATCCTCTCTTAGCAGACATCTGCTGTCTCTCCAGCTTGCTCT  
AGCATGTTAAGGCACAGCTCTCTTACTGCTGACTAGAAAACAGCTGGTTAAATCCACACCGA  
GAATAAGATTCTACTAATCAGCGAAATAAAATAACTCTCAACTGTTAAATGGTATTGGTCTCATTA  
GGTATAGACCTCTCATGTCATTAACTGAGAAAATATGAGAAGGAAACCCAGTCAGGCTCTGCGC  
CCTAGTGTCTACGTGGTGTGGTAATTCAAGCTCACTGCACTGAGACACTACCTGGCTGGAGACTCAG  
GGTGCAGGCTCTGGTCCAGTCCGCTGAGTGCAGCTTGGCCATCCACACTTATCCTC  
CTCATCTCAAGAATCCGTATGAGACAAGGGTGAGATCAGATTCTAGCTCTAAATAATATGTAATT  
TAATTAAAGAGCTGTAAGAGATAATTGAAATGAAAAATGTTACCGGTATGCTGAGCCATAGATAA  
GAACAGAACTATTCTGAAACAAGAAGAATTAAAGAAGAAAATGAACTAGTTGCTTAGTGTG  
TTAGACAAACTGTAGTGCAGGAGTTAGGATCAGTGTGGATGTCGGGGGAATAGAGTTGAACG  
CAGTGATATGATATTGAATCACGGAGTTACTAGTTACGCTCAGTTGAAGAAAATCAAAGGACAG  
AAAGCAAAGTAACATTACTGAGAGGGTGAATTCCAGGGAGGGACCTCTCCTAGGTGATCTAGAAGGCCT  
TTTTTAGAAACAAATAAAACATTAAATAAAGCTTACTAATATTGTTCTGTTTACCCCCATGCTAGC  
TTCACTGATGATCAAATGTTCTGTGAGTTCGAAGACTTTGACACACACACACACACACAC  
TCAGTAATTTCACAAAGAAATGTTAAACTTGTAGCTTCTCTGGTTTGTGTTCTAGATCTTAGATAAAGC  
AACCTGCTTAGATGGAAATGTTAAACTTGTAGCTTCTCTGGTTTGTGTTCTAGATCTTAGATAAAGC  
AACTGTTGCTAGTTGTATCTCTGTTATATCTATTCTGAGGCACTTTCTGTTGTTGTTGTTG  
TGCCTTCAGTAAATGATGCAAGCAACCTGAGCCTCCGTGACACTATCTCCCTGAGGTGCATGAAGAAA  
AAATCAGAGGGAGGATCTCCCTGCTCACTAAGCGATAGCAGAAAAGAACATGAGAAAAGAACAGCTTC  
TCCCTACTGAGATGCACTGAGACACCATTGCAAGATTGAGGAAATGAGGCTTCCACACTGACAACATTAGAT  
GATCAGGGGTTCACTGCAAGAGGGTCAGGTGACGAAGCTGTCAAAACGGACTGGAGAGCCGTTTGC  
GACGTCCGATCTGCTAGGGCTCTCAGTCAGCACCTTCAATTGGTTGGCATTGTTAATGCTTAACCCACC  
GGCACGATGGTACTAAATTGTTGTAATTACCCACACCTGCAATTCTATGCTGTCAGTAAAGATTCTTAT  
ATTCTGAAACTCTCCCTGTAATATCAAGCTTAAATAAGTCAAATAGTTGTCAGTAAAGATTCTTAT  
GGTGTGCAACCGCAGGGACCACAGTGCCTAGAGTCACAGATCCGACAAGTGGCAAAGCCCTGGATGAT  
AGCCGCTTCAGTACAGCAAACCGAAAATATCATTGCAAGGAAAACCTCCACGGGGCCGGAGCTAGACA  
CCAGCTACAAAGGCTACATGAAACTGCTGGGCAATGCACTGAGTAGCAGTATAGACTCCGTGAAGAGACTGGA  
GCACAAACTGAAGGAGGAAGGAGAGCCTCTCTGGTTAACCTGCACTAGTACCGAAACCCAAACG  
GCTGGTGTGATTGACCGATGGGAGCTTCTCCAGGCCAGGCAATTGAGCAAGGAGTTGAGGATGAGCAGA  
ACCTCCAGAAGTGGCAGCAGTTAACCTCAGACTGAAACAGCATCTGGGCTGGCTGGGGACACGGAGGA  
GGAGTTGAAACAGCTCCAGCGTCTGCAACTCAGCACTGACATCCAGACCATCGAGCTCCAGATCAAAG  
CTCAAGGAGCTCCAGAAAGCTGTGGACCACCGCAAAGCCATCATCCTCTCCATCAATCTGCAAGCCCTG  
AGTTCAAGGGCTGACAGCAAGGAGAGCCGGACCTGCAAGGATGTCAGTGCAGATGAATGGCGCTG  
GGACCGAGTGTGCTCTGCTGGAGGAGTGGGGGCTGCTGCAAGGATGCCCTGATGCACTGCCAGGGT  
TTCCATGAAATGAGCCATGGTTGCTTCTATGCTGGAGAACATTGACAGAAGAAAATGAAATTGTCC

Figure 36 part - 100

PCT/U504/06308

CTATTGATTCTAACCTGATGCAGAGATACTTCAGGACCATCACAAACAGCTTATGGTAAGATGTGTGAA  
CTCTGGCAGCCTCCAGTTATTTTAGCAGGGTGCATTCACTTACAGAAAATGAATAAGTGGTAAGT  
GTTGTTCTTTTTAACTTTTGCAATTAGTCTACTTACACTTTTAACTCCCTGTGGTTTC  
CAATTTGTAAGCAAACATGTGCATAGAAGATGATATCTGCTAGCTTAGAATCTGATTCTAAAGTTG  
TTGCTCAGTTGTAAGCAAACATGTGCATAGAAGATGATATCTGCTAGCTTAGAATCTGATTCTAAAGTTG  
TAATTAAACTTCATGTTACATCTATGGCCAAAAGTATATTGGTGGCTGTAGTAAAAGGTCAATTAAA  
ATATTAGAATAGAATGAGACAATTAAAGTCTTTGGTGTGTTGCGATCTCGGCTACTGCATCTCCGCTCCGGGATT  
TCACTCTGTTGCCAGGGTGGAGTGCAGTGGTGCAGTGGCTACTGCATCTCCGCTCCGGGATT  
GAGCAATTCTCGCCAATTCTCGCTCACCCCTCCGAGTAGGTGGACTACAGGTGTAAGCCACCAC  
GCCTCGCTAATGTTGATTTTAGTAGAGACAGGGTTCACCATGTTGCCAGGCTGGTCTCGAACTCC  
TGGCCGAGGTGATCCACCTGCTCAGCCTCCAAAGTGTGGATTACAGGCATGCCACACCCA  
GCCGAGTCTTCAAAGAGGAATTAAATACATCAGATTAAACATGAACACTGAGCATCAAGTTCTGAAAG  
CCAAGACAAAATGGGAAACAAGGAGTAAACTTACTTCATTATCTGGAAAAACAAACATACCAACTTCT  
CAAGGAAGGGAGAAAATTCTAGCACTAAATTCAAGAGGAATTAACTGGTAGACTCTTACAAAGGAT  
CTTGGACAATATAATGTACAGTATTTAGTGAAGATAAGGAAGCATATTGAGTTCCA  
TTAGAAGAAAATATTATGCACTTTGTAGCTCTGTATTTTAAATGTTATGCTTAACATTAAACACT  
CACCTAAACTACAGAATTGGTACCTTTAATTCACTTACATAATAGTCTTAGAAACCTAGAGGAATAGC  
TGTGGAACTGCACTTTTACTTCACTTGACCTCTGGCATCAAGCTGTGAATGAGCAATCACCCCTTTT  
TTTICAAATCTGACTAGATATCAGAGGATACTAGACATACTCTGCTCGCTATATTAAATGTTG  
TTTCTGTTAAAGGATTATCTTACATCTACTGCTCATACTAATCTATATTAAATTACTGTCATATATA  
CATTAACAAATTGAAACCTCCAATAAAACTGTGGACCAAGGCATCAAACACTGAGATCAGAGACGGT  
CAGGGTCTTATAGAATATTGGCAGAGGAGTTAGAAGTCACTCAGGCCGTGAGCTGCTGCATCCTTTA  
GTGTGAGCTCCACGTTGATGCTCAGGTATAATTCCCACCAAGTTAAGTGTGATTGCTTCTGCACTT  
TTGGAGCTTTGCCAATTCAAAATGTTAGAAAAATTAAATTGTTTGTATGCAAGAACATAAG  
CATGAGCTGTTGAATCCCAACTCAGAGTAGCCTTTGCAAGACATGCTTGCAACTACTGGTGAATG  
CTGAAGGAACAGACTGTTAGAAGCCAAAGAAAAGTCCATGTTATGGAAATCGGCTCAAACCTCT  
GAAGGGAGGTCACTCGTCAAGGAACGGAGTTAGACGTGTCAGTAGTCAGCAGGATTG  
TCTTCTGGTCTCTGCTGATGAACTGGACACCTCAGGGCTGTGAGTCCCACATCAGGAAGGGCACC  
CAAACAGACAGAAAACGCCACGGCAAGTGTAGTCTCTCACAGCCGGACCCCTGTGAGCAGTCCACA  
TAGCAGGTCCACAAAAGGGTGGCTCCGATTCCCTCCCTTGAGCTTCTGCTCCCTCATCGGGCTTG  
TTCTGTTCTCAGGTCTCCGAGCAGCTTCTCCCTCAGCTGTGCTCCCTCATCGGGCTTG  
GCCTGTACGGATGTCAGAGGAAGACTACAGCTGTGCTCCCTCATCGGGCTTGTG  
CATGCTCAGATACAGAATGGCCCTCCACTCTGAACTAACAGATGCCATCTGAGAAGTGTGGTA  
GCATAAGGGAGTCATAAGCAATCCAAACTACCAACAAGAGGCCATTGATCTGGCAGAACCCC  
TCGGTGTGGCAGCTTACGGCTCCAGATCACATGTGTCAGGAAATTATGGCTTCAAGAGGTGGAAAGATAA  
ACAGTGACGGGGAAACAAACAGACAACAAGAAGGTTGGAAGAAATCTGTTGAGACTCTGAAACCTTAG  
CACTAAGGAGATTGAGTAAGGACCTCAAAGTCTCCCGGACTCATGAATTCTGGGCCCTGGCCATTCT  
GTGACAGCCAAGGACTTCAGTAGACCATCTGGCAGCTTCCCATGGTGTGCTCAAACCATCAGATAA  
ATGACCCCTCCCAAGCACCAGTGCAGTGTGCTACAATCTACCAACCAACCGAGTGTGAAGAGATTAGAA  
CCTTGTAAACATACAATTAAAGGTTATATGGCAGCTTCTTACCTGTGTTTCTGGGCTG  
ATGTTTAACTTTGCTTAAAGACACAAGCTGTAATCTAAAAGGCACTTTTTAGAGGTATAAGA  
AAAAGTACAGCTAATAAAATAAGATCATGGAAGGCTTATGTGAAAGGTTGAATGTTATAGTAAAAAAA  
AAAGATATTATGTTATGTACAGTTGCTAAAGCAAGTTGTTGATTGATTCTTGCATTATT  
AGATATTATAAAATAAAAAAAAAAAAAAAAAAAAAAA

Human SYNE1 mRNA sequence - var5 (public gi: 21734305) (SEQ ID NO: 187)  
CACTGGCAGGCCGCTCGAGACAGCCTGCTTCTCCACAGCCTCCTCAAATCTCCCTCTCGCTCG  
CTCAGCCCCCTCCGGAGCGAGCGGTAGGACGAGACACCCAGCTAGTGTGGACTCCATCCCCCTGGAGTG  
GGATCACGACTATGACCTCAGTCGGGACCTGGAGTCTGCAATGTCCAGAGCTCTGCCCTCTGAGGATGAA  
GAAGGTCAAGGATGACAAAGATTCTACCTCCGGGAGCTGTGCTTATCAGATGTAATGATCCCCGAGA  
GCCCTGAGGCCATGTAAAACCTACAGAAAATGCAATCAAACACCTCCGGGACACAGTCCCTAGA  
GTACACAGATCCGACAACGGGCAAAGCCCTGGATGATAGCCGTTTCAGATAACAGCAAACCGAAAATATC  
ATTGCGAGCAAACCTCCACGGGCGGAGCTAGACACCAGTACAAAGGCTACATGAAACTGCTGGCG  
AATGCACTAGCAGTATAGACTCCGTGAAGAGACTGGAGCACAACACTGAAGGAGGAAGAGGAGGCCCTCC  
TGGCTTGTAAACCTGCATAGTACCGAAACCCAAACGGCTGGTGTGATTGACCGATGGGAGCTCTCCAG  
GCCCAAGGCTTGTGAGCAAGGAGTTGAGGATGAGCAGAGAACCTCCAGAGTGGCAGCAGTTAACCTCAGACT  
TGACACGATCTGGGCTGGCTGGGACACGGAGGAGTTGGAACAGCTCCAGCGTGGAAACTCAG  
CACTGACATCCAGACCATCGAGCTCCAGATCAAACAGCTCAAGGAGCTCCAGAAAGCTGTGGACCCACCGC  
AAAGCCATCATCTCTCCATCAATCTGCAAGCCCTGAGTTCAACCCAGGCTGACAGCAAGGAGAGCCGG  
ACCTGCAGGATCGCTTGTGAGTGAATGGGCGCTGGGACAGGAGTGTGCTCTGCTGGAGGAGTGGCG  
GGGCTGCTGAGGATGCCCCGTGAGTGCAGTGCCAGGGTTCCATGAAAGTGGCATGTTGCTTCTTATG  
CTGGAGAACATGACAGAAGAAAATGAAATTGTCCTATTGATTCTAACCTTGATGCAAGAGATACTTC  
AGGACCATCACAAACAGCTTATGCAAAATAAGCATGAGCTGGAAATCCAACTCAGAGTAGCCTCTT

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GCAAGACATGTCCTGCCAACTACTGGTAATGCTGAAGGAACAGACTGTTAGAAGCCAAAGAAAAAGTC  
CATGTTATTGAAATCGGCTAAACTTCTCTGAAAGGAGGTAGTCGTCATATCAAGGAACCTGGAGAAGT  
TATTAGACGTGTCAGTAGTCAGCAGGATTGTCTCTGGTCTCTGCTGATGAACTGGACACCTCAGG  
GTCTGTGAGTCCCACATCAGGAAGGAGCACCCAAACAGACAGAAAAGCAGCAGGAGCAAGTGTAGTC  
TCACAGCCTGGACCCTCTGCAGCAGTCCACATAGCAGGTCCACAAAAGGTGGCTCCGATTCCCT  
CTGAGGCCAGGGCAGGTGGCTCCGGCGCTCTGTTAGTCAGAGTCCTCGAGCAGCTCTCCCC  
GCTTCTCCTGCTCTCCTCATCGGGCTTGCTGCTGCTGACCAATGTCAGAGGAAGACTACAGCTGTGCC  
CTCTCCAACAACCTTGCCCCGTCACTCCACCCCATGCTCAGATAACCGAATGGCCCTCTCCACTTGAA  
CTAACAGAGATGCCATCTGCAGAAGTGTGGTAGCATAAAGGAGGATCGGGTCTAAGCAATCCAAACTAC  
CAACAAAGAGGAGGATCTGGCTGATCTGGCAAAGGCCATCGGTGGCAGCTTAGCCCTCTCCAGATCACATGT  
GTGCAAATTATGGCTTCAGAGGTGGAAGATAAACAGTGAGGGGAACAAACAGACAACAAGAAGGTTG  
GAAGAAATCTGGTTGAGACTCTGAACCTTAGCAGATAAGGAGATTGAGTAAGGACCTCCAAAGTCC  
GACTCATGAATTCTGGGCCCTGGCCATTCTGTGCACAGCCAAGGACTTCAGTAGACCATCTGGCAGC  
TTTCCCATGGTGTGCTCCAACCATCAGATAATGACCCCTCCAAGCACCAGTCAGTGTGTCATAATCT  
ACCAACCAACCAAGTGTGAAGAGATTAGAACCTGTAACATACAATTAAAGAGCTTATATGCCAGC  
TTCCCTTTTACCTTGTTCCTGGGCATGATGTTTAACCTTGCTTAAAGGCAACAGCTGAAAT  
CTAAAAGGCACTTTTTAGAGGTATAAAGAAAAGTGTAAATAAGATCATGGAAGGCTTA  
TGTGAAAAAGTGTAAATGTTAGTAAAGATATTATGTTAGTACAGTTGCTAAAGCCAAG  
TTTGTGTTGATTGATTCTTGCTTATTATAGATATTATAAAAGAAAAAAAAAAAAAA

Human SYNE1 mRNA sequence - var6 (public gi: 21750070) (SEQ ID NO: 188)  
TCAGAGGGTGCTCAATGCTTCTGAAAGCTGTGATGAACTCACCGACATCCTCCAGAGCAGGAGCAG  
CAGGGGCTGCAGGAAGCTGTCAGAAAGCTCCACAAACAATGAAAGGATCTCAAGGAGAAGGCCCTTATC  
ATTTGCTTCATCTGAAGAAATTGATGTTGAGAAGATAAGGTTCTAGCCTCTGAGAAGAATGCAAG  
GCTGATGAGAGACCAAGCTGATGCCAGGAAGGAGCTGAAAGGTTACAGCTCATGAGGAACCTGTGAAAC  
TTCAGTGCACAAAGGCTCCTCATCTCTGTGAGAAAAGGTTACAGCTCATGAGGAACCTGTGAAAC  
TCCCAGTGGGGACCCAGTAAGGGACACCTGAAACCTGTCACTGACTCTCAAAGAGCTCAGAGCTGC  
CTTGGACAGCACCTACAGGAAGCTCATGGAAGACCCAGACAAGTGGAGGACTACACTAGCAGATTCT  
GAGTCTCATCTGGATATCTACAAATGAGACACAATTAAAGGGATCAAGGGTGAGGCCATCGATACTG  
CCAACCACGGAGAGGTTAACGTGCCGTTGAAGAGATCAGAAATGGTGTACCAAAAGGGTGAGACCT  
CAGCTGGCTGAAATCCAGGCTGAAAGTTGACAGAAGTTCTCTGAGAATGAAGCCAAAGCAGGGA  
GATGAGCTGGAAAATTATCCAGCTTCAAGGCTTGTGACGCTGCTGAGGTTGAAAAGATGC  
TAAGCAATTGGGGACTGTGTCAGTACAAAGAAATAGTCAAAATTCTCTGAGAAGATTAAATTCTGG  
CTCTAAAGAAGTCCAGGAACAAGCTGAGAAGATCTGGATACTGAAAATTCTGTTGAAGCAGCAGTT  
CTTCTCATCACCAGCAAAGACAAAGCGGATCTCAGCAAAGAAGAGAGATGTGAGCAGCAGATCGC  
AGGCGCAGGGAGAAGGGGGCTGCGTGCAGGAGGAGCTGCGGAAGCTGGAGGACACT  
GGATGGCCTGGAGCGCAGCGGGAGAGGGCAGGAACGCCGATCCAGGTCAATTAAAGAAAATGGGAGCGA  
TTGAAACAAACAAAGAACAGTGTAAAGGATCTTCAACAGGTTCCAGTCATGACGCTTCTGAA  
GTTTAGCAGTTGAAAGTTATCTCAGAACTGGAACAAACAAAGGAGTTCTAAACGGACAGAAAG  
TATTGCACTCAGGCTGAGAACCTTGTAAGGAAGCTTCAGAGATACCGCTGGGCCAAAATAAGCAG  
CTGCTCAACAGCAGGCCAGTCATGAAAGACACGCTTGAAGAAGAGT  
ATGTGATTGACAAGTCTAAACTTCTCTGAGATAAGTTCTACATCAATTCTCTGTACCTGTAT  
TCAAAACACTCTAAATCTCAAAGTGTCTGTATTCAGCATGTTGAGGAAACAACTCACAGTTCA  
AAAGAAAGTATCGCTAAACAGAAACCAATATCTATAACAGAGCCAAAATATAAGGATGTGGGTT  
TGCATCTTAAACTGATCATGTTCATGAGAAAGCCATATCTATTCTATTCTGTGGCTTGTACATTGAG  
AGGAAATCTTGAAAGAACTAATATTAAAATAATTCTTAACTATATTCTGTGTGTCACCTTGT  
AGCGAAAAGGAGATATTGTTAGTGTAGATTCCAGGCCAAACATCACATGACCTATATCTCC  
AACCTGAAGAAGCTCTGGAGCTTACAGTGCCTGGTATTCAAGTATCTGACTAATATGCTCTT  
TCCAGAAATTAACTTTAAACTTTAACTTTAACTTTAACTTTAACTTTAACTTTAACTTTAACTTTAACT

Human SYNE1 mRNA sequence - var7 (public gi: 28192521) (SEQ ID NO: 189)  
CATATACAGCTGATAAAATCTCTCTGACCTCTGGGACCCATAGGTGCCTGGCTGACAGAGGGAGG  
TGGCCCTGAGAGAGGAAATAACCGTTCAACAGGCTCACGAGGAAACAGCAAACACGATACAACGGAAACT  
TGAGCAACATAAGAGAAAATGCCGACATGTTAGTGGATCTGCTTCAAAACACGGATGCCACAAAAGAGCA  
TTCCATGAAATCTACCGGACAGGCTGTTAACGGGATTCCAGTGCCACTGATCAATTAGAGGACATGG  
CCGAGAGGTTCTATTGTTCTGGGCCACATCAGAGCTACACCTAATGAAATGGAAATTAGAATTAAA  
GTACCGTCTGCTCACTGCTGGTTCTGAGAGTCAGAGCTGAAAGTGTCTGGATCATTAAGTACGGGAGG  
AGAGAGTCAGTGGAGCAGCTTCAACAAACTACGTTCTTATAGAAAATAGCAAGTTCTTGAAACAAT  
ATGAGGTGACATACCAAGATCTGAAACAGACAGCTGAGATGTATGTCAGGAGATGGTCAAGTGGAGA  
AGCTGAGAATGTGATGAAATTCTGAGTAAAGGACCCGCTCAGTGGAGGAATCTCTAGAGAAGTGGAGG  
AGTGTGAGGAGCATGCTGGAGAAGTGTATCTCAACTGGGATCGCTATGCAATACAGTGGCTAGTCTGC  
AAGCCTGGCTAGAGGATGCTGAAAAATGCTCAATCAATCAGAAAATGCCAAAAGGATTTTCGAAA

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TTTACCTCATTGGATTCAAGCAGCATACTGCCATGAACGATGCTGGCAATTCTAATTGAAACCTGTGATGAGATGGTTCCCGTGACCTGAAGCAGCAATTACTGTTGCTAAATGGCGTGGAGGGAGTTGTTATGG  
AAGTCAGCAATATGCTCAAGCTGATGAGATGGACAGAATGAAGAAGGAATACACAGACTGTGTTGTTAC  
CCTGCTGCTTGTCAACGGAAGCCCATAAGAAACTTCTGACCCCTTAGAAGTCTCTTTATGAATGTC  
AAGCTATTAAATTCAGACTGGAGGATATTGAGCAGAGGGTGCCTGTGATGGATGCCAATACAAGATAA  
TTACAAAGACAGCACACCTCATTACCAAAGAAAGCCCCAAGAAGAAGGAAAAGAAATGTTGCGACCAT  
GTCAAAGCTCAAAGAGCAGCTAACCAAGGTCAAAGAATGTTACTCCCCACTCCTTATGAGTCTCAGCAG  
CTGTTGATTCCGGTGGAGGAATTAGAAAAGCAGATGACGTCTTATGACTCACITGGAAAATCAATG  
AAATTATCACAGTTCTGAGCGTGGAGGAAATTAGAAAAGCAGATGACGTCTTATGACTCACITGGAAAATCAATG  
AGCTGTCAAGAAAACGTAAAGAAAACCTGACACTTATTGAGAAGGAGCTCAAAGTGTCAAAGT  
GTGACCTTGAGCAACGTGTTAAAGCATTGATCAGCAGGGTACAAAGACAGATTGAGATATTGAG  
TTGCTTTCAGAGTATGGTAAAGAAAACGGAGATTGAGAAGCATGTTGAAACCAACAGTCGCTTGT  
GAAGAAGTTGAGGAGTCTGAGCAGAGTTGGAGAAGGTAAGCTGCGGATTGCTCAGGAGGGCTGGAGGAA  
AAGGGGATCCAGAGGAGCTCTGCGGAGACACACTGAGTTTCAAGTCACTGAGGAGTCTGAGGAG  
ATGCTTCTGAAAGCTTGTGATGAACTCACCGACATCCTTCAGAGCAGGAGCAGCAGGGCTGCAGGA  
AGCTGTTGAAAGCTCCACAAATGGAAGGATCTTCAAGGAGAAGGCCCTTATCATTGCTTCATCTG  
AAGATTGATGTGGAGAAGAATAGGTTCTAGCCTCTGAGAAGGAAATGAGCTGAGGAG  
CCAAAGCTGATGCCCTGAGGAGCTGAAAGGAGTCAAAGGAGAAGGCCCTAGCTGGCTGAAAT  
TCCTCATCATCTGTGAGAAAAGGTTACAGCTCATGAGGAACCTGAGGAGTCTGAGGAG  
CCAGTAAGGGACACACCTGAACTGTACAGTCACTCTCAAAGAGCTCAGAGCTGCCATTGACAGCACCT  
ACAGGAAGCTCATGGAAGACCCAGACAAGTGGAAAGGACTACACTAGCAGATTCTCTGAGTTCTCATCTG  
GATATCTACAAATGAGACACAATTAAAGGGGATCAAGGGTGGAGGCCATCGATACTGCCAACACGGAGAG  
GTTAAACGTGCCGTTGAAGAGATCAGAAATGGTGTACAAAAGGGGTGAGACCCCTAGCTGGCTGAAAT  
CCAGGCTGAAAGTTTGACAGAAAGTCTCTGAGAATGAAGCCAAAAGCAGGGAGATGAGCTGGCAA  
ATTATCCAGCTTTCAAGGCTCTTGAGCAGCTGAGGTTGAAAGATGCTAAGCAATTITGG  
GACTGTGTCAGTACAAAGAAATAGTCAAAATTCTCGAAGAATTAAATTCCTGGCTCTAAAGAAGTCC  
AGGAACAAGCTGAGAAGACTTGGATACTGAAATCTGTTGAAGCAGCAGCTGAGCAGCAGGG  
GCAAAGACAAAGGGATCTCAGCAAAGAAGAGAGATGTGAGCAGCAGCTGGAGAG  
GAAGGGGGCTCTGAGCAGGAGGGCTGCGGAAGCTGGAGAGCAGCAGGG  
GCAGGGGGAGAGGAGCAGGAACGCCCATCCAGGTACATTAAAGAAAATGGAGCGATTGAAACAAACAA  
AGAACAGTAGATAAGATACTTTCAACAGGTTCCAGTCAGAACGCTTCTGAGTTAGCAGTTG  
GAAAGTTTATCTTCAGAACTGGAACAAACAAAGGAGTTCTAAACGGACAGAAAAGTATTGAGCTCCAGG  
CTGAGAACCTGTAAGGAAGCTCAGAGATAACCGCTTGGGCCAAAATAAGCAGCTGTTCAACAGCA  
GGCCAAGTCATCAAAGAACAGTCAAAAATTAGAACAGCCTGAGAAGATATTAAACCATGGAA  
ATGGTAAAACCAAGTGGATCATTTGGCAGTAATTGAGACTCTGTCCTGATAACTGAGAAAG  
AAAAAGAACTCAATGCCCTGGAAACTTCGTACATGCCATGGACATGCAAATCAGCCAAATTAAAGTCAC  
AATTCAAGGAATAGAAAGTAAAGCTCAGCAGCATTGAGGATTAGAAGAAGAAGCCAGTCTTCTCAG  
TTTGTACCACTGGAGAATCTGTCGAAATTAAAGCCAGTTGACACAAAATAAGAAGATACGGGGAAAGGC  
TTCGAGAGCATGCCAGTGTCTGGAGGAACAACTCTGGGACATTCTCAGCAGCAGAAAAGTTGAAGA  
GAACCTTAGAAAGATCCAGCAATCTGTCGAAATTGAGATAAAACTTGCTGTTCAATTAAATATGT  
TCTTCAGCTACAGAAACATCAAAGTCTTCAAGAACATATGGATCTGCCAGGCCCTGGAGTCAGTGA  
GCAGCGCAGTCACTGCCCTCAGCCAGTGCAGGAAGGTTGAGAACAGAGATTCTGTTCAAGGAGG  
TGCAGCTCACAGCAGCAATACGAGGACATCTAAGGAGGGCGAAGGAGAGACAGACGGCGCTGGAGAAT  
CTGCTGGCCACTGGCAGAGGCTAGAGAAAAGAACTATCATCCTTTGACCTGGTTAGCGGGGGTGAAG  
CTAAAGCCAGTCCCCAGAAATGGACATTCTGAGACAGAGTCAAAGTGGAAAGGTGAACCTCAGTTAAT  
ACAGGCAAGTCAAGGAAGTGTGAGGAAGGAAAAATAAAATGCTTTGTTACAGTTACATTATTTAAA  
ATAATAAAATAAAACTTGTAAAAAAAAAAAAAA

Human SYNE1 mRNA sequence - var9 (public gi: 17861377) (SEQ ID NO: 191)  
AAGGTAAGCCACTAGAGAGAAACTGAAAGAAAATTCTAAGATAATTGACATTCTCT  
AAAAATATGATTATAGACCACAGATAGGAATTAAAGAGTTCTGATAATTGAGCTTCAATTATTTAA  
AGGATTATCAAGAGGAATTGCTATTGCTCAAGAGAACAAATACAGCTCAACAAATGGAGAACGACT  
TGCTAAAGCCAGCCATGAAAGCAAGCATCTGAGATTGAATACAAGCTGGAAAGGTCAACGACCGGTGG  
CAGCATCTCTGGACCTCATTCAGCAGCCAGGGTGAAGAAGCTGAAGGAGACCCCTGGTAGCCGTGCAGCAGC  
TTGATAAGAACATGAGCAGCCTGAGGACCTGGCTCGCTCACATCGAGCTGGCCAAGCCAATAGT

Figure 36 part - 103

CTACGATTCTGTAACTCGGAAGAAATACAGAGAAAGCTTAATGAGCAGCAGGAGCTTCAGAGAGACATA  
 GAGAAGCACAGTACAGGTGTGCATCTGCTCAACCTGTGTGAAGTCTGCTGCACGACTGTGACGCCT  
 GTGCCACTGATGCCGAGGTGACTCTATACAGCAGGCTACGAGAAACCTGGACCGGGCGTGGAGAAACAT  
 TTGTGCTATGTCATGGAAAGGAGGCTGAAAATCGAAGAGACGTGGCATTGTGGCAGAAATTCTGGAT  
 GACTATTACGTTTGAGATTGGCTGAAGTCTCAGAAAGGACAGCTGCTTTCCAGCTCTCTGGGG  
 TGATCTATACAGTTGCCAAGGAAAGAACATTAAGAAAATTGAGGCTTCCAGCGACAGGTCCACGAGTGCCT  
 GACCGAGCTGGAAGTCAACAGACTGAGTACCGCCCTGGCAGGGAGAACCGCACTGATTCAAGCATGT  
 AGCCTCAAACAGATGGTCAGAAGGCAACCAGAGATGGGACAACCTGCAAAGCGTGTACCTCCATCT  
 TCGCAGACTCAAGCATTTATTGGCCAGCGTAGGGAGTTGAGACTGCGGGGACAGCATTCTGTCTG  
 GCTCAAGAGATGGATCTGAGCTCACTAATATTGAACATTTCAGTGTGATGTTCAAGCTAAAATA  
 AAGCAACTCAAGGCCCTCCAGCAGGAAATTCACTGAACCACAATAAGATTGAGCAGATAATTGCCAAG  
 GAGAACAGCTGATAGAAAAGAGTGAGCCCTGGATGCAGCGATCATGAGGAGGAACTAGATGAGCTCCG  
 ACGGTACTGCCAGGAGGTCTCGGGCGTGTGGAAAGATAACATAAGAAACTGATCCGCTGCCCTCCCCA  
 GACGATGAGCACCGACCTCTCAGACAGGGAGCTGGAGACTCTGAGCTCTGCGACTCGGACACT  
 GGCACGACCGCTCTGAGACAGCCTGCTTCTCCACAGCCTTCTCCAATCTCCCTCTCGCTCGCTCA  
 GCCCTCCGGAGCGAGCGTCAAGGAGACACCCCAGCTAGTGTGGACTCATCCCCCTGGAGTGGGAT  
 CACGACTATGACTCAGTCCGGACCTGGAGCTGCAATGTCCAGAGCTCTGAGCTCTGCGCTCGCTCA  
 GTCAGGATGACAAAAGATTCTACCTCCGGGAGCTGCTGCTTATCAGATGTAATGATCCCCGAAAGCCC  
 TGAGGCTATGAAAACTCAGAAAATGCAATCAAATACCTCCGGGACACAGTGCCTAGAGTCA  
 CAGATCCGACAACAGCCCTGGCTGGAGCTAGACACCGACTACAAAGGCTACATGAAACTGCTGGGGAATG  
 GCAGAAAACCTCCCACGGGCGGAGCTAGACACCGACTACAAAGGCTACATGAAACTGCTGGGGAATG  
 CAGTAGCAGTATAGACTCCGTGAAGAGACTGGAGCACAAACTGAAGGAGGAAGAGGAGAGCCTCTGGC  
 TTTGTTAACCTGCAAGTACCGAAACCCAAACGGCTGGTGTGATTGACCGATGGGAGCTCTCCAGGCC  
 AGGCATTGAGCAAGGAGTTGAGGATGAAGCAGAACCTCCAGAAGTGGCAGCTTAACACTGAGACTTGA  
 CAGCATCTGGGCTGGCTGGGGACACGGAGGAGTTGGAACAGCTCCAGCGTCTGGAACTCAGCACT  
 GACATCCAGACCATCGAGCTCCAGATCAAAGCTCAAGGAGCTCCAGAAAGCTGTGGACCACCGCAAAG  
 CCATCATCCTCTCCATCAATCTCTGAGCCCTGAGGTTCACCCAGGCTGACAGCAGAACGGAGCGGGACCT  
 GCAGGATCGCTTGTGAGATGAATGGCGCTGGGACCGAGTGTGCTCTGCTGGAGGAGTGGGGGG  
 CTGCTGAGGATGCCCTGATGCACTGGCAGGGTTTCCATGAAATGAGCCATGGTTGCTTATGCTGG  
 AGAACATTGACAGAAGAAAATGAAATTGTCCTATTGATTCTAACCTGATGAGAGATACTTCAGGA  
 CCATCACAAAACAGCTTATGCAAAATGAGCTGAGGTTGGAATCCAACTCAGAGTAGCCTCTTGCAA  
 GACATGCTTGGCAACTACTGGTGAATGCTGAAGGAACAGACTGTTAGAAGCCAAAGAAAATGCCATG  
 TTATGGAATCGCTCAAACCTCTGAGGAGGTCACTGTCATATCAAGGAACGGAGTTATT  
 AGACGTGTCAGTAGTCAGCAGGATTGTCTCTGGCTCTGCTGATGAACTGGACACCTCAGGGTCT  
 GTGAGTCCCACATCAGGAAGGAGACCCCAAACAGACAGAAAAGCCACGGAGGCAAGTGTAGTCTCTCAC  
 AGCCTGGACCCCTGTGAGCAGTCCACATAGCAGGTCACAAAAGGTGGCTCGATTCCCTCCCTTCTGA  
 GCCAGGGCCAGGTGGTCCGCCGCGCTTCTGTCAGAGTCTCCGAGCAGCTCTCCCTCAGCTT  
 CTCCGCTCTCCCTCATGGGCTTGCCCTTGACCAATGTCAGAGGAAGACTACAGCTGTGCCCTCT  
 CCAACAACCTGGCCGCTTCCACCCATGCTCAGATACAGCAATGGGCTCCACTCTGAACACTAA  
 GCAGATGCCATCTGAGGAGCTGGTAGCATAAGGAGGATGGGCTATAAGCAATCCAAACTACCAAC  
 AAGAGGACCTTGATCTGGGAAAGGACCTGGTGTGGCAGCTTAGGCTCTCCAGATCACATGTC  
 AAATTATGGCTTCAAGGGTGAAGATAAACAGTGAACGGGGAAACAAACAGACAAAGAACAGGTTGGAAG  
 AAATCTGGTTGAGACTCTGAACCTTAGCAACTAGGAGATTGAGTAAGGACCTCAAAGTCCCCGGACT  
 CATGAATTCTGGCCCTGGCCCATTCTGTCAGCAGCAAGGACTTCAGTAGACCATCTGGCAGCTTCC  
 CCAAGGTGCTGCTCCAACCATCAGATAAAATGACCCCTCCAAAGCACCAGTCAGTGTGTCACATCTACCA  
 ACCAACCCAGTGTGAAGAGATTAGAACCTTGAAACATACAAATTGAGGCTTATATGGCAGCTTCC  
 TTTTACCTTGTGTTCTGGGGCATGTTAACCTTGCTTAAAGGCTTATGCTTAAAGCACAAGCTGTAATCTAA  
 AAGGCACCTTTTTAGAGGTATAAAGAAAAACTAGATGTAATAAATAAGATCATGGAAGGCTTATGTG  
 AAAAGAGTTGAATGTTAGT

Human SYNE1 mRNA sequence - var10 (public gi: 17861385) (SEQ ID NO: 192)  
 CAAAAATCAGTCTGATCTCGGGAAACCTGGAGAAATTATTTCTGTACTCTAAATGTCCTTCATTTGG  
 TGACCATCAAGGTGCTGGGAGAGGAATTAGATGGCTGAATTCAAAGTAAATGGAATTAGATGCAAGCAGT  
 ACAGAAATTCTGGAACAGAATGGCCAACGGGTAAGGCCACTGGCCAAGAAAGATAGGAAACACTGACTGAA  
 CTTCACCGAGACCATAGACAAGCTGAGAATCGGCTCTCCAAGCTCACTCAGGCAACATCACATTAG  
 AAGAATAACATGAAATTGTCAGATTAAATTGAGGTTGAGGATGGGAAAGCTAAAGTCTTGGCTCATGGAAC  
 TATTGCACTGGAAATTGTCAGCAGCTGGGAGGAAACATATTGTCAGTACCTCACTAGCGTGTACTGTACAG  
 AAAGAAATTGACAGTGTGAGGCTGGAGCAATGACTGAGGAAATTACAGTACCTCACTAGCGTGTACTGTACAG  
 AAAAGAAATTGTCAGCAAGTGGCAGAACGGGAGACTGAGGAGTTGCGACAGATGATCAAATTG  
 TTTGCAAGACCTCCAAGATGCAAGCTGAGGATATGAAAGGAGGAGTTGAGGAGTTGAAAGTACAAGCT  
 GCCTGGAGCAAGCCCAGGCAACACTGACTCTCTCAGAAGTGGCAGTCTCAGTCTCAAGGAGCAGCT  
 CTCATCGGCAGCATTTGTTGCTGAGATGGAGTCACTGAGGCCAGGAGTGGCAAGCAGTGCAGCTGCCA  
 GAGTGCCTCCGGATCCCCGAGGATGTGGITGCCAGCTTACCTCTGTCATGCTGCTCTGCCAG

Figure 36 part - 104

GAAGAGGCCAGCCGGCTGCAGCACACGCCATCCAGCAGTGTAAACATCATGCAGGAAGCTGTGGTACAAT  
ATGAACAATATGAGCAAGAAATGAAACATCTCAGCAACTGATAGAAGGGCTCACAGAGAGATTGAGGA  
TAAACCTGTTGCCACCAGTAACATACAGGAGCTGAGGCTCAGATTCTCGGCATGAGGAGCTGGCGAG  
AAAATTAAAGGGTACCAAGGAGCAGATCGCTTCTTGAAATTCAAGTGCAGATGCTGACGATGAAAGCCA  
AGCACGCCACCATGCTGACGGTACGGAGGTGAGGGGCTGGCGGAAGGGACAGAGGACCTGGATGG  
GGAGCTCCTCCCCACGCCCTCGGCCACCCCTCTGTGGTCATGACTGCAGGTGCGCTCACACTTIG  
CTGTCACCGGTCACTGAGGAGCTGGGAGGAGGAACCAAACAGTGAGATTCTCTCCACCTGCGCTGTC  
GCTCCCTTCACCTGTGGCTAACAGATGCTTCTGTTAACCCAGGACATTGCAATTACCAAGCCTGTC  
TGCTGAGAGGTTGCAAGACAGATGCTGCAAAAATTCAACCCAGCACATCCGCATCCCAGGAGTTCTATGAA  
CCGGATTGGAGGCATCCGCTACTGCCAACACTGGGTGATTGAGCAGGTTCTGGGAAACCTTAAAGAATG  
TGATCAGTGGAGAACAGCAGCAGCACACTCTATGAAGCTTGGAGCAGCAGAACAGTACCAAGGACTCCCTCCA  
GTCATCTCTACGAAGATGGCCATTGAGCTGAAACACTCAGTGAGAGGCCAGGCTGGCAGGAGTCCA  
GAAAGCCAGATGGCTAACATCAGGATTGATGGAGATTCTCATGCTCCAGGATGAAATCAATGAGC  
TCCAGTCTCTCGCAGAGGAGCTGGTATCCGAGCTTGTGAGGCCGACCCCTGCGGAGCAGCTGGCCTT  
GCAGTCCACGCTCACTGCTTAGCCAGCGAATGTCACCATCAGGATGAAAGCCTGGGGAAACGGCAG  
CTTGGAGGAGAAGTTGAATGATCAGCTGGAGGAACAAAGGCAGGAACAGGCCGCTGAGAGGTATCGCT  
GTGAAGCCAGTGGAGCTGGACAGCTGGCTCTGAGTACCAAGGCCACTCTGGACACTGCGCTGAGTCCACC  
CAAGGAGCCCAGGACATGGAGGCCAGCTTATGGACTGCCAGAATATGCTGGGAAATAGAGCAGAAG  
GTGGTGGCTTATCAGAACTGTCAGTCACAATGAGAACCTGCTGCTGGAGGGCAAAGCTCACACCAAGG  
ACGAGGCCAGCTGGCTGAAAGCTGAGAACAGCTCAAGGGGAGCCTGCTGGAGCTGCAGAGAGCCCT  
GCATGATAAGCAGCTAACATGAGGGAAACAGCACAGGAGAAGGGAGAGCAGTGTGACCTAACAGCC  
ACGAGAGCCCCGGCTCAGGAATGGCTGGCCAAAGCTGCAACACATGGACCCAGCAGGGCAGAGCA  
GTCTCAGCAAAAGAGATTCTAATTCAACATTGGCGCAGAGACCTCTGGTATGCTGGGAAAAACCTGAT  
GTGTATCCAGGAGTTGGGATGAAAGGGAGAAATCATGGCTGAGACAGAGATGAGAATGAAATGGG  
AAAGCTACATCAAGAATTAGTACCAAGCAGAAACTACTACAGAATGTTCTGGAACAGGAACAAGAGCA  
AGTGTATAGCAGGCCAATCGACTCTGCTGGTGTGCCACTGTACAAAGGGACGTGCCAACCCAA  
GATAATCTGCAGTTACATTTGCTGGATGGACTGAAACCAAGCCTCGAGGAGGTTCATCCAGAGTG  
GAGGGGAAAGAGGCAGAGTATAACTTGGAGCAGAAGTTGTATGATGGAGCTCAGCCACCTCTACTTG  
GTTGGATGACGTTGAAGAACGTTATTGTTGCCACAGCACTTTACCAAGAAGAACAGAGACTTGTCTC  
TTCAACCAAGAGATTCTGCCAACAGACATTAAGGAAATGTCAGAAGAAATGGATAAGAACAAAACCTGT  
TTTCCAAGCTTCCAGAGAATGGTATAATGAGATGTTATTGAGAATACTTGGGTGCTTTGGG  
CAGGTTATCTGCTAGACTCAGTAGTGAATCAAGCTGTCATCAGATGAAAGAACACTTCAGCAAATA  
CTAAATTCTCAGAATGATCTGAAAGCTGCTGTTACATCACTGGCTGACAACAAATACATCTGCAA  
AACTGGCAAATGTTGAAGACGGCTAGCAGAACAAATAGAGGCAATACAACAGGCTGAAGATGGACT  
CAAAGAATTGATGCAGGAATCATTGAAATTAAAGAGGCGTGGTACGAGCTACAGGTCGAGCAGCGTCC  
ATGCAAGAACTCTCAAGCTCCAGGACATGTATGATGAGCTGATGATGATCATGGCTCCGGAGGAGTG  
GTCTGAATCAGAACCTTACACTCAAGAGTCAGTAGTGAAGAGGCCCTACAAGATCTGGCTGACCTGCTAGA  
AACTGGTCAGGAGAAGATGGCAGGAGACCAGAAAATCATGCTGCTTCAAAGAGGAAATCCAGCAACCA  
CTTGACAAACATAAGGAATACTTTAGGGCTGGATCTATGATCTTGTACTGTAACACTCTCAGAA  
AGATAATCAGCTTGCAGTCCAAAAGGAAACCCAGTCCATACAGAGCTGATGGCTCAGGCTCTGCTGT  
ACTGAAACGGCTCACAAGAGGGGTGAGCTGGAGTACATTCTAGAGACGCTGGTCCATCTGGATGAG  
GACCAGCAGGAGCTCAGCAGACAGCTGGAGGTGGAAAGCAGCATCCCAAGCTGGGTCTGGTGGAGG  
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GCCCAAATTATCAAGTATTAGTGTGGGAAACGACTTCTGATATCCATCAGCTGCTCAGATCTAGAA  
AGCCAACTAAATCAACTTGGAGAGTGTGGCTTAAGTAACACCAAATAAAATGCTAAGGAACCTCACAGAC  
TGGAAACAATATTGAAACACTGGAGCAGATATCAAAGTGAATCTGAGATCTAATTCACTGGTTACAATC  
TGCAAAAGACGGCTAGAATTGGACTCAGCAATCTGTCAGTCCCACAAGAGCTGGAAATGGCCGT  
GATCATCTAAATGCTTCTGGAGTTCTAAAGAAGTGGATGCCAATCTCCCTGAAATCATCTGTT  
TGAGTACTGAAATCAGCTCTCGACTAAAAAGGTTGGACACAGCCACGCTGCGCTCTGAGTTGCG  
CATTGATAGCCAGTGGACTGACCTGCTAACCATATCCAGCCGCTCAGGAGAACGCTCCACCAGCTCAG  
ATGGATAAACTGCTTCCCGCATGCCATTCTGAAAGTCATGAGTTGGACTCTCTAATGAAATGCTA  
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TAAGGTTTAAGATAGACATTAACAGTAAACAGTGCAGTGGATTGAGCTGAGGAAACGACTCCGTCTACAA  
ATCAGCAGTCAGGATGTGGAAAGTAAGCTGAGTGAATGAGACTGATTGAGCTGAGCAACTTGGAGCAATGA  
ATAAAAGTTGGAAATTCTGCAAGGCTAGTAACATGAGAAGATCCAGCTGGAGGCTTATTGAAATC  
TTGGTCAGAATATGAAAATAATGTCAGTAACTGCTGAAAACATGGTTGAAACCCAGGAAAGAGACTAAA  
CAACAGCAGTCAGGATGTGGAGATCAGGCTCTGTCAGGCTTCTGTCAGGAAACCTGGGAAATTTAGATCAC  
TGATTAAGCAGGAAAGATAAGAGTGAAGAAAATTGAGCAGAACATGGACTGCTTGGATTGATCAGACAAGAA  
AGAAGACGTCTAGCATTGTCATGAGCACACTGGAGAGCAGCTGGCCAAACCTGGGAAATTTAGATCAC  
ATGGTTGGACAAATTAAAGATACTGTCAGTAACTGCTGAGGACATGCTGAGGATCTGGACTGGCTCTT  
ACAAGATAAAACAGTTACCTCATGGAGGCCAGATACTCTCTTCCGATCCGCTGACTGGCTCTT  
AGAAGCTGTGCAAGTTCAAGGTTGACAACTTCAGAATCTCCAAGATGATCTGGAAAACAGGAAAGGAGC

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TTACAGAAATTGGCTTATCACCAACCAATTATAAAAGAGTGTACCCACCGTGACAGAAACTCTTA  
CCAATACACTGAAAGAAGTCACCATGAGATGGAATAACTTGTGGAAGAGATTGCTGAGCAGCTACAGTC  
CAGCAAGGCCCTACTTCAGCTTGGCAAAGATAACAAGGACTACTCCAAACAGTGTGCTTCGACAGTTAG  
CAGCAGGAGGATCGAACCAATGAGCTGGTAAGGCAGGCCAAACAAGGACATTGCCATGATGAGGTTG  
CCACATGGATTCAAGATTGCAACGACCTCCCTAAAGGACTGGCACAGTTAAAGATTCCCTTGTCT  
CCATGAGCTGGGAGAGCAACTGAAAGCAACAAGTGGATGCTCCGAGCATTAGCTTCAATCGGATCAA  
CTCTCTTGAGTCACACACTGTGTGCTCTGGAGCAAGCTCTGCAAACAGCAGACTTCATTACAGGCTG  
GAGTCTTGATTATGAAACACCTTGCCAAAGAGTTAGAAGCTTGGAGGCTGGATAGTGGAGCTGAAGA  
AATACTACAAGGGCAGGACCCTAGCCACTCATCTGACCTCTCACAATCCAGGAAGGATGGAAGAACTT  
AAGGACAGATGTTAAATTCAAGCAGCATGGCTCCAGATTAGACCGTCTAAATGAGCTGGATATAGGT  
TACCCCTGAATGATAAGGAAATCAAAGAATGCAAGATCTGAAACGCCATTGGTCTCTGATCTCTCTCA  
GACTACAGAAAGATTCAAGCAGTTGAGTCATTGGCTACAACATCAGACTTCTGGAAAAATGTGAA  
ACATGGATGGAATTCTAGITCAGACAGAACAAAGTTAGCAGTAGAGATTCAAGGAAATTACAGCACC  
TTTGGAACAGCAGAGAGCACAGGTTCAAGCCAGATGTTCAAGCTGAGCAGATTGCACTC  
AATCATTATTGATGGCAACGCTTCTAGAACAAAGGTCAGTTGATGACAGGGATGAACTCAACCTGAAA  
TTGACACTCCTCAGTAATCAATGGCAGGGAGTGATTCGAGGGCCAGCAGAGGCGGGGATCATGACA  
GCCAGATTCGCCAGTGGCAGCGCTATAGGGAGATGGCAGAAAAGCTCGTAAATGGTTGGTGAAGTGTG  
CTACCTCCCCTAGTGGTCTCGGAAGTGTCTTCTATACCACTGCAACAAAGGACCCCTTGTGATGAA  
GTGCAAGTCAAAGAAAAGTGGCTCGGGCAACAAAGGCACTACATCTGACTGTGAGGCTGGCAAGC  
AACTCTCTCTCGCGGAGCTGGCCTGAGGCCCTTGCAAGGCCACTCGCTGAAATCCAAGAGAA  
ATGAAATCAGCCAGCATGGCAGTGGAGAACAGAAGAAAAGTAGCCTCTGTGAAAGACTGGGAA  
AAATGTGAGAAAGGAATAGCAGATTCTGGAGAACACTAGAACATTTCAAAAGAACGTTGCACTC  
TCCGGATCACCATGAAGAGCTCCATGCAAGAACAAATGCGTGCAGGAATTAGAAAATGCACTGGAG  
CTGGACAGATGACTTGAACCCAGTTGAGGCTGCTGAAGGACACCTCTGCTCTGCTTATATCAGTGTGATGAT  
ATCTCCATTCTTAATGAACCGTAGAGCTCTGCAAAGGCACTGGGAGAAACTATGCCACCAGCTCTCT  
TAAGCGGCAGCAAATAGGTGAAAGATTGAATGAATGGCAGTCTCAGTGAAGAACAAAGGAACTCTG  
TGAGTGGTTGACTCAAATGAAAGCAAAGTTCTAGAACATGGAGACATTCTCATTGAAGAACATGAG  
AAGCTCAAGAAGGATTATCAAGAGGAATTGCTTAAAGAGAACAAATACAGCTCCAACAAATGG  
GAGAACAGCTTGTCAAAGCAGCCATGAAAGCAGAACAGCTGAGATTGAATACAAGCTGGGAAAGGTCAA  
CGACCGGTGGCAGCATCTCTGGACCTCATGAGCCAGGGTGAAGAACAGCTGAAGGAGACCCCTGGTAGCC  
GTGCAAGCAGCTGATAAGAACATGAGCAGCCAGGGTCACTGGCTCGTCACATCGAGTCAGAGCTGGCCA  
AGCAAATAGTCTACGATTCTGTAACTCGGAAGAACATACAGAGAACAGCTTAAATGAGCAGCAGGAGCTTCA  
GAGAGACATAGAGAACAGTACAGGTGTTGACATCTGCTCTAACCTGTGAGTCTGCTGACAGC  
TGTGACGCCCTGCAACTGATGCCAGGTGACTCTATAACAGCAGGCTACAGAGAACACTGGACCAGCG  
GGAGAAACATTGTGCTATGTCATGGAAAGGAGGCTGAAAATCGAAGAGACGTGGCATTGTCAGGAGAA  
ATTCTGGATGACTATTACGTTGAAGATTGGCTGAAGTCTCAGAAAGGACAGCTGCTTTCCAGC  
TCTCTGGGTGATCTATACAGTTGCCAACAGAACACTAAAGAAATTGAGGCTTCCAGCAGAGGTCC  
ACGAGTGCCTGACGCAGCTGAACTGATCAACAAAGCAGTACCGCCGCTGCCAGGGAGAACGCACTGA  
TTCAGCATGTAGCCTAAACAGATGGTCACGAAGGCAACCAGAGATGGGACAACCTGCAAAAGCGTGT  
ACCTCCATCTGCCAGACTCAAGCATTATTGCCCCAGCGTGAGGAGTTGAGACTGCGCGGGACAGCA  
TCTCTGGCTGGCTCACAGAGATGGATCTGCACTCAAAATTGAAACATTCTGAGTGTGATGTTCA  
AGCTAAAATAAGCAACTCAAGGCCCTTCCAGCAGGAAATTCTACTGAAACCCACAATAAGATTGAGCAG  
ATTGCCCAAGGAGAACAGCTGATAGAAAAGAGTGAGCCCTTGGATGCGAGCAGTACATCGAGGAGAAC  
ATGAGCTCCGACGGTACTGCCAGGGCTTCTGGCGTGTGAAAGAACCTACATAAGAACACTGATCCGCT  
GCCCTCTCCCAGACGATGAGCACGACCTCTCAGACAGGGAGCTGGAGCTGAAAGACTCTGAGCTCTG  
GACCTGCACTGCCAGGCCCTGCAAGCACAGCCTGCTTCTCCACAGCCTCTCCAATCTCTCCCT  
CGCTCGCTCAGGCCCTCCGGAGCGAGCGGTCAAGGAGCACACCCAGCTAGTGTGACTCCATCCCC  
GGAGTGGGATCACGACTATGACCTCAGTGGACCTGGAGTCTGCAATGTCCAGAGCTGCTGCCCTGAG  
GATGAAGAACAGGTCAGGATGACAAGATTCTACCTCCGGGAGCTGTTGCTTATCAGGGGACCACAGT  
CCCTAGAGTCACAGATCCGACAACCTGGCAAGGCCCTGGAGTATAGCGCTTTCAGATAACAGCAAACCGA  
AAATATCATTGGCAGAAAACCTCCCACGGGCCGAGCTAGACACCGAGTACAAAGGCTACATGAAACTG  
CTGGCGAATGCCAGTAGCAGTAGACTCCGTGAAGAGACTGGAGCACAACACTGAAGGGAGGAAGAGGAGA  
GCCCTCTGGCTTGTAAACCTGCACTAGTACCGAAACCCAAACGGCTGGTGTGATTGACCGATGGGAGCT  
TCTCCAGGCCCTGGCAGGATGGCAAGGAGTTGAGGATGAAGCAGAACCTCCAGAACAGTGGCAGCAGTTAAC  
TCAGAGTGAACAGCATCTGGCCCTGGGGAGCACCGAGGAGGAGTTGAGACAGCTCCAGCGTCTGG  
AACTCAGCAGTGCACATCCAGACCATCGAGCTCCAGATCAAAAGCTCAAGGAGCTCCAGAACAGTGTG  
CCACCGCAAAGGCCATCATCTCTCCATCAATCTGCAAGGCCCTGAGTTCAACCCAGGCTGACAGCAAGGAG  
AGCGGGACCTGCAAGGATCGCTTGTGCAAGATGGCGCTGGGACCGAGTGTGCTCTGCTGGAGG  
AGTGGCGGGGCCCTGCTGCAAGGATGCCCTGAGTGCAGTGCAGGGTTCCATGAAATGAGCCATGGTTG  
TCTTATGCTGGAGAACATTGAGAGAAAATGAAATTGTCCTTATTGATTCTAACCTTGATGCAAG  
ATACTTCAGGACCATCACAAACAGCTTATGCAAATAAAAGCATGAGCTGTTGAAATCCAACCTCAGAGTAG  
CCTCTTGCAAGACATGTCCTGCCAACTACTGGTGAATGCTGAAGGAACAGACTGTTAGAAGGCCAAAGA  
AAAAGTCCATGTTATTGAAATCGGCTCAAACCTCTTGAAGGAGGTAGTCATATCAAGGAACTG

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GAGAAGTTATTAGACGTGTCAAGTAGTCAGCAGGATTGTCTTCTGGTCTTCTGCTATGAACTGGACA  
CCCTCAGGGTCTGTGAGTCCCACATCGGAAGGAGCACCCAAACAGACAGAAACGCCACGAGGCAAGTG  
TAGTCTCTCACAGCCTGGACCCCTGTCAAGCAGTCCACATAGCAGGTTCCACAAAAGGTGGCTCCGATTC  
TCCCTTCTGAGCCAGGCCAGTCGGTCCGGCCGCGGTTCTGTTAGAGTCCTCCGAGCAGCTCTTC  
CCCTTCAGCTTCTCCTGCTCCTCCTCATCGGGCTTGCCTGCTTGTACCAATGTCAGAGGAAGACTACAG  
CTGTGCCCTCTCAAACAACCTTGCCCCGGTCAATTCCACCCCATGCTCAGATACACGAATGCCCTCCCTCCA  
CTCTGAACTAAGCAGATGCCATCTGCAGAAGTGCTGGTAGCATAGGAGGATCGGGTCAAGAACATCCC  
AAACTACCAACAAGAGGACCTTGATCTTGGCAGAAGGCCCTCGGGTGGCAGCTTCTAGGCCCTCCAGAT  
CACATGTGCAAAATTATGGCTCAGAGGTGGAAAGATAAACAGTGACGGGGGAAACAAACAGACAACAGA  
AGGTTGGAAAGAAATCTGGTTTGGACTCTGAACCTTAGCACTAAGGAGATTGAGTAAGGACCTCCAAAG  
TTCCCCGGACTCATGAATTCTGGGCCCTGGCCCATCTGTGTCACGCCAAGGACTTCAGTAGACCATCT  
GGCAGCTTCCCATGGTGTGCTGCCAACATCGATAATGACCTCCCAAGCACCAGTGTAGTGTGCT  
ACAATCTACCAACCAACCAGTGTGAAAGAGATTTAGAACCTTGTAAACATACAATTAAAGAGCTTATA  
TGGCAGCTTCTTTTACCTTGTGTTTCCCTTGGGGCATGATGTTAACCTTGCTTAAAGGCACAAGC  
TGTAAATCTAAAAGGCACTTTTTAGAGGTATAAAGAAAAACTAGATGTAATAAAAGATCATGGAA  
GGCTTATGTGAAAAAGTGTGAATGTTAGT

Human SYNE1 mRNA sequence - var11 (public gi: 17227153) (SEQ ID NO: 193)  
AACTCCTCTCGGGGACAGTGGCCTGAGGCCCTGAGGCCACTCGCTGAAATCCAAGAGAA  
ATGGAATCAGCCAGCATGCGGTGGAAGAACAGAAGAAAAACTAGCCTTCTGTTGAAAGACTGGAA  
AAATGTGAGAAAGGAAATAGCAGATTCCCTGGAGAAACTACGAACITTCAAAAGAAGCTTCAGTC  
TCCCAGATCACCATGAAGAGCTCCATGCAGAACAAATCGCTTGCAAGGAATTAGAAAATGAGCTGGAG  
CTGGACAGATGACTTGACCCAGTTGAGCCTGCTGAAGGACACCCTCTGCCTATATCAGTGTGATGAT  
ATCTCCATTCTTAATGAACCGTAGAGCTCTGCAAAGGAGTGGAAAGAACTATGCCACCAAGCTCTCCT  
TAAGGCAGCAAATAGGTGAAAGATTGAATGGCAGTCITCAGTGAAAGAACAGGAACACTCG  
TGAGTGGTGAACCAAATGGAAGCAAAGTTCTCAGAATGGAGACATTCTCATTGAAGAAATGATAGAG  
AAGCTCAAGAAGGATTATCAAGAGGAAATTGCTATTGCTCAAGAACAAAATACAGCTCCAACAAATGG  
GAGAACGACTTGCTAAAGCCAGGATGAAAGCAAAGCATCTGAGATTGAATAACAGCTGGGAAAGGTCAA  
CGACCGGGTGGCAGCATCTCCTGGACCTCATGCGACCCAGGGTGAAGAGCTGAAGGAGACCCCTGGTAGCC  
GTGAGCAGCTGATAGAACATGAGCAGCTGAGGACCTGGCTCGCTCACATCGAGTCAGACTGGCCA  
AGCCAATAGTCTACGATTCTGTAACTCGGAAGAAAATACAGAGAAAGCTTAATGAGCAGCAGGAGCTTCA  
GAGAGACATAGAGAACAGTACAGGTGTTGATCTGCTCAACCTGTGTGAAAGTCTGCTGACGAC  
TGTGACGCCGTGCCACTGATGCCAGTGAGTGTGACTCTATACAGCAGGCTACGAGAACCTGGACCGCGGT  
GGAGAAACATTGTGCTATGTCCATGGAAAGGAGGCTGAAAATCGAAGAGACGTGGCATTGTGGCAGAA  
ATTTCTGGATGACTATTACGTTTGAAGATTGGCTGAAGTCTCAGAACAGGACAGCTGCTTTCCAGC  
TCTTCTGGGTGATCTATACAGTTGCCAAGGAAGAACATAAGAAATTGAGGCTTCCAGCGACAGGTCC  
ACGAGTGCCTGACGAGCTGAACTGATCAACAAGCAGTACCGCCCTGGCAGGGAGAACCGCACTGA  
TTCAGCATGTAGCCTAAACAGATGGTCACGAAGGCAACCAGAGATGGACAACCTGCAAAGCGTGTGTC  
ACCTCCATCTGCGCAGACTCAAGCATTATTGGCCAGCGTGAGGAGTTGAGACTGCGCGGGACAGCA  
TTCTGGTCTGGCTCACAGAGATGGATCTGAGCTCACTAATATTGAACATTCTGAGTGTGATGTTCA  
AGCTAAAATAAAAGCAACTCAAGGCCCTCCAGCAGGAAATTCACTGAGACCACAAATAAGATTGAGCAGATA  
ATTGCCAAGGAGAACAGCTGATAGAAAAGAGTGAACGGCTTGGATGCGAGCATCTGAGGAGGAAACTAG  
ATGAGCTCCAGGGTACTGCCAGGAGCTGGCTTGGAGGAGCTGGAGCTGGAGACTCTGAGCTCTGCG  
GCCTCTCCAGCAGATGAGCACGCCCTCTCAGACAGGGAGCTGGAGCTGGAGACTCTGAGCTCTGCG  
GACCTGCACTGGCAGGCCGCTCTGAGACAGGCCCTGCTTCTCCACAGCCCTCTCAATCTCCCTCT  
CGCTCGCTCAGCCCCCTGGAGGGAGCGTCAAGGAGAACCCCCAGCTAGTGTGGACTCCATCCCCCT  
GGAGTGGATCACGACTATGACCTCAGTGGACCTGGAGTCTGAATGTCCAGAGCTCTGCCCTCTGAG  
GATGAAGAAGGTCAAGGATGACAAAGATTCTACCTCCGGGAGCTGGCTTATCAGGGGACCACAGTG  
CCCTAGAGTCACAGATCCGACAACGGGAAAGGCCCTGGATGATAGCCGTTTCAGATACAGCAAACCGA  
AAATATCATTGCAAGAAAACCTCCACGGGGCCGGAGCTAGACACCAGCTACAAAGGCTACATGAAACTG  
CTGGGCGAATGCACTAGCAGTATAGACTCCGTGAAGAGACTGGAGACAAACTGAAGGAGGAAGGAGA  
GCCTTCTGGCTTGTAACTGCATAGTACGGAAACCCAAACGGCTGGTGTGATTGACCGATGGAGCT  
TCTCCAGGCCAGGATTGAGCAAGGAGTTGAGGATGAAGCAGAACCTCCAGAAGTGGCAGCAGTTAAC  
TCAGACTGAAACAGCATCTGGGCTGGCTGGGGACACGGAGGAGCTGGAGACTCTCAGCGTCTGG  
AACTCAGCACTGACATCCAGACACCAGCTCCAGATCAAAAGCTCAAGGAGCTCCAGAACAGCTGTGGA  
CCACCGCAAAGCCATCATCTCTCCATCAATCTCTGAGGCCCTGAGTTCACCCAGGCTGACAGCAAGGAG  
AGCGGGGACCTGCAAGGATCGCTTGTGCGAGATGAATGGCCGCTGGAGCTGGAGTGTGCTCTGCTGGAGG  
AGTGGCGGGGCTGTCAGGATGCCCTGAGTGCAGTGGCAGGAGTGGCTTCCATGAAATGAGCCATGGTTGCT  
TCTTATGCTGGAGAACATTGACAGAAGGAAAATGAATTGCTTCTGAGTCTAACCCTGATGCAAGAG  
ATACTCAGGACCATCACAAACAGTTATGCAAAATAGCATGACCTGTTGGATATCCAACTCAGAGTAG  
CCTCTTGCAGACATGCTTGCCTACTAGTGGTAATGCTGAAGAACAGACTGTTAGAAGGCCAAAGA  
AAAAGTCATGTTATTGAAATCGGCTCAAACCTCTCTGAGGAGGTCAAGTGTGATGCAAGGAG  
GAGAAGTTATTAGACGTGTCAGTAGTCAGCAGGATTGCTTCTGGTCTCTGCTGATGAACTGGACA

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CCTCAGGGTCTGTGAGTCCCACATCAGGAAGGAGCACCCAAACAGACAGAAAAACGCCACGGAGCAAGTG  
TAGTCTCTCACAGCCTGGACCCTCTGTAGCAGTCCACATACAGAGTCACAAAAGGTGGCTCCGATTCC  
TCCCTTCTGAGCCAGGGCAGGTGGCTCGGCTCGGCTTCCCTGTCAGAGTCCTCCGAGCAGCTCTC  
CCCTCAGCTTCTCCTGCTCCCTCATGGGCTTGCCCTGTACCAATGTCAGAGGAAGACTACAG  
CTGTGCCCTCCAACAACCTTGGCCGTCACTCCACCCATGTCAGATAACAGAATGGCCCTCCAGA  
CTCTGAACTAAGCAGATGCCATTCGAGAAGTGTGGTAGCATAGGAGGATCGGGTCATAAGCAATCCC  
AAACTACCAAGAGGACCTTGATCTTGGCAAAGGCCCTGGTAGCTTACGGCCCTCCAGAT  
CACATGTGTCAAATTATGGCTCAGAGGTGGAAAGATAAACAGTGACGGGGAAACAAACAGACAACAAGA  
AGGTTGGAAGAAATCTGGTTGAGACTCTGAACCTTAGCAGATAAGGAGATTGAGTAAGGACCTCCAAAG  
TTCGGGACTCATGAATTCTGGGCCATTCTGTCACGCCAGGACTTCAGTAGACCATCT  
GGCAGCTTCCCAGGTGCTGCCAACCATCAGATAATGACCCCTCCAAGCACCAGTCAGTGTG  
ACAATCTACCAACCAACCAGTGTGAAGAGATTCTGAACCTGTAAACATACAATTAAAGAGCTTATA  
TGGCAGCTCCCTTTACCTTGTGTTGCCCCATGATGTTTAACCTTGCTTAAAGCACAAGC  
TGTAATCTAAAGGACTTTTTAGAGGTATAAGAAAAGTAGATGTAATAAAAGATCATGGAA  
GGCTTATGTGAAAAAGTGTAAAGT

Human SYNE1 mRNA sequence - var12 (public gi: 16550165) (SEQ ID NO: 194)  
ACAAAAGAGCATTCCATGAAATCTACCGGACCAGGTCTGTTAACGGGATCCAGTGCCACCTGATCAATT  
AGAGGACATGGCGAGAGGTTTCACTGGCTTCTCCACATCAGAGCTACACCTAATGAAAATGAAATT  
TTAGAATTAAAGTACCGTCTGCTCTACTGCTGGTCTTGAGAGTCAGCTCAAAGCTGAAGCTTGGATCATTA  
AGTACGGGAGGAGAGTCAGTGGAGCAGCTTCTACAAACTACGTTCTTATAGAAAATAGCAAGTT  
CTTGAAACAATATGAGGTGACATACCAAGATCTGGAAACAGACAGCTGAGATGTATGCAAAGCAGATGGT  
TCAGTGGAAAGAAGCTGAGAATGTTGATGAAATTCTGAATGAAACCCACCGCTCAGTGGAGGAATCTCTAG  
TAGAAGTGAGGAGTGTGAGGAGCATGTTGAGAAGTGTCTAATCTGGATCGTATGGCAATACAGT  
GGCTAGTCTGCAAGCCTGGCTAGAGGTGCTGAAAATGCTCAATCAATCAGAAAATGCCAAAAGGAT  
TTTTTCGAAATTACCTCATTGGATTCAAGCAGCATACTGCCATGAACTGCTGGCAATTTCATAATTG  
AAACCTGTGATGAGATGGTTCCCGTGACCTGAAGCAGCAATTACTGTTGCTAAATGGCGGTGGAGGGA  
GTTGTTATGAAAGTCAAGCAATATGCTCAAGCTGATGAGATGGACAGAATGAAGAAGGAATACACAGAC  
TGTGTTGTTACCCCTGTCGCTTTGCGACGGAAGGCCATAAGAAACTTCTGAAACCTTGTGAGTCTCTT  
TTATGAATGTCAAGCTTAAATTCAAGACTGGAGGATATTGAGCAGGGTGCCTGTGATGGATGCCA  
ATACAAGATAATTACAAAGACAGCACACCTCATTACCAAGAAAGGCCCAAGAAGAAGGAAAAGAAATG  
TTTGCACCATGTCAAAGCTCAAAGAGCAGTAAACCAAGGCTAAAGAATGTTACTCCCCACTCCTTATG  
AGTCTCAGCAGCTGTTGATCCGGTGGAGGAAATTAGAAAAGCAGATGACGTCCTTTATGACTCACTGG  
GAAAATCAATGAAATTATCACAGTCTGAGCGTGGAGGACACACTGAGTTTCTAGTCAGCTGGATCA  
CAGAACTGTTAGCTGCAAGAAAACCTGAAAGAAAACCTTGACACTTATTGAGAAGGCAAGTCAAAGTG  
TTCAAAAGTTGTCACCTGAGCAACGTGTTAAAGCATTGATCAGACGAGGCTACAAAGACAGATTG  
AGATATTCTGTTGTTCTAGAGTATGGTAAAGAAAAGTGGAGATTGAGAAGCATGTTGAAACCAAC  
AGTCGCTTGTGAGAAGAGTTGAGGAGTCTGACAGAGTTGGAGAAGGTACTGCGATTGCTCAGGAG  
GCCTGGAGGAAAAGGGGATCCAGAGGAGCTCCTCGGGAGACACACTGAGTTTCTAGTCAGCTGGATCA  
GAGGGTGCTCAATGCTTCTGAAAGCTGAGTGAACCTCAGACATCCTCCAGAGCAGGAGCAGCAG  
GGCTGCAGGAAGCTGTCGAAAGCTCCACAAACAATGAAAGGTGAGTCAGGACAGGAGGACACCGT  
GCATCCTCAATGAAGGGAGAAGCTGAGCTGTTAAGGTCAAATGTAAGAGAAATTAGAAATTCTGG  
AAAGTCACTGTAACTATTGCTCATTAAAAACTGGAATTAAACCTGATAATATA  
TG

Human SYNE1 mRNA sequence - var13 (public gi: 16553949) (SEQ ID NO: 195)  
ATAGTAGAATTATTCTATTATAATTGGCTTGACAAAAATCAGTCTGATCTCGGAAACCTGGAGAAA  
TTTATTTCTGTACTCTAATGTTCTTCACTGGGATGACCATCAAGGTGCTGGAGAGGAATTAGATGGC  
TGTAATTCAAAGTTAATGAAATTAGATGAGCAGTACAGAAATTCTGAAACAGAAATGGCCAACCTGGGTA  
AGCCACTGGCCAAGAAGATAGGAAAACCTGACTGAACTTCACCAAGCAGACCATAGACAAGCTGAGAATCG  
GCTCTCCAAGCTCAATCAGGAGCAGTACATTTAGAAGAATACAATGAAATGTTGAAATTATGAAAG  
TGGATTGAAAAGCTAAAGCTTGGCTCATGGAACTATTGAGTGGAAATTCTGCAAGCCAGCTTGGGAAAC  
AATATATTGTCATCAGACCTGCTAGAAGAATTTGAGCAGCTGAGCTGAGAATGACTGA  
GAAATTACAGTACCTCACTAGCGTGTACTGTACAGAAAATGCTCAGCAAGTGGCAGAACTGGGACGG  
GAGACTGAGGAGTTGCGACAGATGATCAAATTGCTTGTGAGAACCTCCAAGATGAGCTAAGGATATGA  
AAAAATTGAGCAGAGTTGAAAAGTACAAGCTGCTTGGAGCAAGGCCAGGCAACACTGACTTCTCC  
AGAAGTTGGACGTCAGTCTCAAGGAGCAGCTCTCATCGGAGCAGATTGTTGCTGAGATGGAGTCA  
CTGAAGCCAGGTGCAAGCAGTGCAGCTCTGCCAGAGTGCCTCCGGATCCCGAGGATGTGGTTGCCA  
GCTTACCTCTGTCATGCTGCTCGGGCTGCAAGGAAGAGGGCCAGCCGCTGAGCACACCGCCATCCA  
GCAGTGTAAACATCATGCAAGGAGCTGAGTACAATGAAACATGAGCAAGAAATGAAACATCTCCAG  
CAAATGATAGAAGGAGCTCACAGAGAGATTGAGGATAAACCTGTTGCCACAGTAACATACAGGAGCTGC  
AGGCTCAGATAACAGAATGCCCTCCACTCTGAACTAAGCAGATGCCATCTGAGAAGTGGTAG

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CATAAGGAGGATCGGGTCATAAGCAATCCAAACTACCAACAAGAGGACCTGATCTGGCGAAAGCCCT  
CGGTGTCAGCTTACGCCCTCCAGATCACATGTGCAATTATGGCTTCAGAGGTGGAAGATAAAA  
CAGTGACGGGGAAACAAACAGACAACAAGAAGGTTGGAAAGAAATCTGGTTGGGACTCTGAACCTTAGC  
ACTAAGGAGATTGAGTAAGGACCTCCAAAGTCCCAGACTCATGAATTCTGGGCTCTGGCCATTCTG  
TGCACAGCCAAGGACTTCAGTAGACCCTGAGCTTCCATGGTGTCTCAACCATCAGATAAAA  
TGACCCCTCCAAGCACCAGTCACTGCTGTAACATCACCAACCAACAGTGTGAAAGAGATTTAGAAC  
CTTGTAAACATAACATTAAAGAGCTTATATGGCAGCTTACCTTACCTTCTTGGGCATGA  
TGTGTTAACCTTGTCTTAAAGCACAAGCTGTAATCTAAAGGACTTTTAAAGGTTATAAGAA  
AAACTAGATGTAATAAAAGATCATGAAAGGTTATGTGAAAAAGTGTGATGTTAGTAAAGGAA  
AAGATATTATGTATGTACAGTTGCTAAAGCCAAGTTGTTGTTGATTTCTTGCATTTATTATA  
GATATTATAAAAAT

Human SYNE1 mRNA sequence - var14 (public gi: 12698056) (SEQ ID NO: 196)  
ACAAACGAAACTTGAGCAACATAAGGATCTGCTTCAAAACACGGATGCCACAAAAGAGCATTCCATGAA  
ATCTACCGGACCCAGGTCTGTTAACGGGATTCAGTGCCACCTGATCAATTAGAGGACATGGCCGAGAGGT  
TTCATTTGTTCTCCACATCAGAGCTACACCTAATGAAAATGAAATTAGAATTAAAGTACCGTCT  
GCTCTCACTGCTGGTTCTTGAGAGTCAAAGCTGAAAGTCTGGATCATTAAGTACGGGAGGAGAGTCA  
GTGGAGCAGCTCTACAAAATACGTGCTTTATAGAAAATAGCAAGTCTTGAAACAATATGAGGTGA  
CATACAGATCTGAAACAGACAGCTGAGATGTATGTCAAAGCAGATGGTCAGTGGAAAGAAGCTGAGAA  
TGTGATGAAATTCTATGAAATGAAACACCAGCCTCAGTGGAGGAATCTCTCAGTAGAAGTGGAGGAGTGTGAGG  
AGCATGCTGGAAGAAGTGTCTCTAACCTGGGATCGCTATGCCAAATACAGTGGCTAGTCTGCAAGCCTGGC  
TAGAGGATGCTGAAAAAAATGCTCAATCAGAAAATGCCAAAAGGATTTTTCGAAAATTACCTCA  
TTGGATTCTCAGCAGCATACTGCCATGAAAGCAGTGGCAATTCTAATTGAAACACTGTGAGATGGTT  
TCCCGTGACCTGAAAGCAGCAATTACTGTTGCTAAATGGCGGTGGAGGGAGTTGTTATGGAAGTCAAGC  
AATATGCTCAAGCTGATGAGATGGACAGAATGAAAGGAATACACAGACTGTGTTACCTGTCTGC  
TTTGCAACGGAAGCCCATAAGAAAATTCTGAAACCTTCTAGAAGTCTTTATGAAATGTCAGCTTAA  
ATTCAAGACTGGAGGATATTGAGCAGAGGTGCTGTGATGGATGCCAATACAAGATAATTACAAAGA  
CAGCACACCTCATTACCAAAGAAAGCCCCAAGAAGAAGGAAAATGTTGCGACCATGTCAGCTTAAAGCT  
CAAAGAGCAGCTAACCAAGGTCAAAGAATGTTACTCCCCACTCTTATGAGTCTCAGCAGCTGTTGATT  
CCGGTGGAGGAATTAGAAAAGCAGATGACGTCTTATGACTCACTGGGAAAATCAATGAAATTATCA  
CAGTTCTGAGCGTGAGGCACATCGAGTGCCCTTTAAACAAAACATCAGGAACGTGTTAGTGTCA  
AGAAAATGTAAGAAAACCTTGACACTTATTGAGAAAGGAGCTCAAAGTGTCAAAACTTGTGACCTTG  
AGCAACGTGTTAACGATTGATCAGACGAGGCTACAAAGACAGATTGAGATATTGTCAGATATTCTGTT  
AGAGTATGGTAAAGAAAATGGAGATTGGAAGAAGCAGATGTCGAAACCAAGCAGTGTGTT  
TGAGGAGTCTGAGAGTGGAGAAGGTACTCGGGATTGCTCAGGAGGGCTGGAGGAAAAGGGGAT  
CCAGAGGAGCTCTGGGGAGACACACTGAGTTTCAGTCAGCTGGATCAGAGGGTGTCAATGCTTCC  
TGAAAGCTTGTGATGAACTCACCGACATCCTTCAAGCAGCAGGGCTGAGGAAGCTGTTCG  
AAAGCTCCACAAACATGAAAGGATCTCAAGGAGAAGCCCTTATCATTGCTTCACTGAAAGATTGAT  
GTGAGAAGAATAGGTTCTAGCCTCTGAGAAGAATGCGAGACTGAGCTGGATCGAGAGGACCAAGCTGA  
TGCCCCAGGAAGGCAGTGGAAAGATAATTAAAGAGCACAGGTTTCTTCAGTGCACAAAGGTCTCATCA  
TCTCTGTGAGAAAAGGTTACAGTCATCGAGGAACCTGTGAAACTCCAGTGGGGACCCAGTAAGG  
GACACACCTGGAACCTGTCACGTGACTCTCAAAGAGCTCAGAGCTGCCATTGACAGCACCTACAGGAAGC  
TCATGGAAGACCAGACAAGTGGAGGACTACACTAGCAGATTCTGAGTTCTCATCTGGATATCTAC  
AAATGAGACACAATTAAAGGGATCAAGGGTGAGGCCATCGATACTGCCAACACCGGAGAGGTTAAACGT  
GCCGTTGAAGAGATCAGAAATGGTGTACCAAAAGGGGTGAGACCCCTCAGCTGGCTGAAATCCAGGCTGA  
AAGTTTGACAGAAGTTCTCTGAGAATGAAAGCCTAAAGCAGGGAGATGAGCTGGCAAAATTATCCAG  
CTCTTCAAGGCTCTGTGACGCTGCTGAGGGTTGAAAAGATGCTAAGCAATTGTTGGGACTGTGTC  
CAGTACAAAGAAATAGTCAGGAAACTCTGAGAAGGTTGAGCAGCTTCTCATCACCAGAAAAGAC  
CTGAGAAGATCTGGATACTGAAAATCTGAGAAGCAGCTTCTCATCACCAGAAAAGAC  
AAAGCGGATCTCAGCAAAGAAGAGATGTCAGCAGCAGATCGCGCAGGGCAGCAGGGAGAAGGGGG  
CTGCGCTGACCGAGGCCACGGAGCTGGGAAGCTGGAGAGCACACTGGATGGCTGGAGCGCAGCCGG  
AGAGGCAGGAACGCCGATCCAGGTACATTAAGAAAATGGAGCGATTGAAACAAACAAAGAAACAGT  
AGTAAGATACCTTTCAAACAGGTTCCAGTCATGAAACGTTCTGAGTTTGTGAGCTTGGAAAGTTA  
TCTTCAGAACTGGAAACAAACAAAGGAGTTTCTAAACGGACAGAAAGTATTGAGTCCAGGCTGAGAAC  
TTGAAAGGAAGCTTCAGAGATACCGTTGGGCCAAAATAAGCAGCTGCTTCAACAGCAGGCAAGTC  
AAATCAAAGAACAGTCAAAAAATTAGAAGACACGCTTGTGAGAAGAGTATGTGATTGACAAGTCTAAACT  
TTCTCTGAGATAAAACTTCATACAATTCTCTGTACCTTGTATTCTAAACACTCTTTAAATCTC  
AAAGTGTCTGTGTTGAGGAAACAAACTCACAGTCAAAGAAGTATCGCTAATACA  
GAAACCAATATCTATAACAGAGCCAAAAAAATAAGGATGTGGGTTTGTGATCTAAACTGATCATGT  
TCATGAGAAGGACCATATCTATTCTATTCTGTGGCCTTGTACATTGTAGAGGGAACTTGTAAAAGAACT  
AAATTTAAAATAATTCTTACTATATTCTGCTGTACCATTTAGAGCGAAAAGGAGATTTGT  
TAGTGTAGATTCAGGCCCTAAATACACATCACATAGACCATATCTCAACCTGAGAAGCTCTGGAG  
CTTGTGTTACAGTGCCTCGTATTCAAGTTATGCTCTTCCAGAAATTAACTTTAAAT

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ATTTTATTTTAACTTTAATGTTGTTATCTG

Human SYNE1 mRNA sequence - var15 (public gi: 2895592) (SEQ ID NO: 197)

CAACCTGCATAGAACGAAACCAAACGGCTGGTGTATTGACCGATGGGAGCTTCAGGCCAGGCAT  
TGAGCAAGGAGTTGAGGATGAAGCAGAACCTCCAGAAGTGGCAGCAGTTAACTCAGACTTGAAACAGCAT  
CTGGCCTGGCTGGGGACACGGAGGAGTTGAAACAGCTCCAGCGTCTGGAACTCAGCACTGACATC  
CAGACCATCGAGCTCCAGATCAAAAAGCTCAAGGAGCTCCAGAAGCTGTTGACAGCAAGGAGAGCAGGAAAGCCATCA  
TCCTCTCATCAATCTCTGAGCCCTGAGTTGACAGCAAGGAGCTGACAGCAAGGAGAGCAGGAGCTGAGGAG  
TCGCTTGCGCAGATGAATGGCGCTGGGACCGAGTGTGCTCTGCTGGAGGAGTGGCGGGGCTGCTG  
CAGGATGCCCTGATGCAGTGCAGGCCAGGTTCCATGAGCAATGGCTTGTCTTATGCTGGAGAAC  
TTGACAGAAGGAAAAATGAAATTGTCCTTATTGATTCTAACCTTGATGCAGAGATACTTCAGGACCATCA  
AAACAGCTTATGCAAATAAGCATGAGCTGTTGAACTCCAACAGAGTAGCCTTGTCAAGACATG  
TCTTGCACAACTACTGGTGAATGCTGAAGGAACAGACTGTTAGAAGCAGAAAGAAAAAGTCCATGTTATTG  
GAAATCGGCTCAAATCTCTTGTCAAGGAGGTAGTCATATCAAGGAACACTGGAGAAGTTATTAGACGT  
GTCAAGTAGTCAGCAGGATTGTCCTCTGGTCTCTGCTGATGAACTGGACACCTCAGGGTCTGTGAGT  
CCCACATCAGGAAGGAGCACCCAAACAGACAGAAAAGCCACGAGGCAAGTGTAGTCTCTCACAGCCTG  
GACCCTCTGTCAAGCAGTCCACATAGCAGGTCCACAAAAGGTGGCTCCGATTCTCCCTTCTGAGCCAGG  
GCCAGGTGGTCCGGCCGGCTTCTGTTAGAGTCCTCCGAGCAGCTTCTCCCTCAGCTTCTCCCTG  
CTCCCTCATCGGGCTTGCCTGCTTGTACCAATGTCAGAGGAAGACTACAGCTGTGCCCTCTCCAACA  
ACTTGGCCCGTCATCCACCCATGCTCAGATACAGAATGGCCCTCTCCACTCTGAAACTAAGCAGATG  
CCATCTGCAGAAGTGTGTTAGCATAAGGAGGATCGGTCTGAGCTTGTGCAATTCCAAACTACCAACAAGAGGA  
CCTTGATCTTGGCGAAAGCAGTCCGAGGTTAGCCCTCCAGATCACATGTTGCAAAATTAT  
GGCTTCAGAGGGTGGAAAGATAAACAGTGAACGGGGAAACAAACAGACAACAAGAAGGTTGGAGAACATTCT  
GGTTGAGACTCTGAACCTTAGCAGTAAGGAGATTGAGTAAGGACCTCCAAAGTTCCCGACTCATGAA  
TTCTGGGGCTTGGCATTCTGTGTCAGCAGGACTTCAGTAGACCATCTGGCAGCTTCCATGGT  
GCTGCTCCACCATCAGATAATGACCTCTCCAAAGCACCAGTCAGTGTGTCAGTACAATCTACCAACCAAC  
CAGTGTGAAGAGATTAGAACCTTGTAAACATACAATTGTAAGAGCTTATATGGCAGCTTCTTTTA  
CCTTGTCTTCTTGGGCTGATGTTAACCTTTGCTTAAAGCACAAGCTGAAATCTAAAGG  
ACTTTTTTTAGAGGTATAAGAAAAACTAGATGTAATAAGATCATGGAAGGCTTATGTGAAAAAAA  
GTTGAATGTTAGTAAAGAAAAAAAAAA

Human SYNE1 mRNA sequence - var16 (public gi: 6330956) (SEQ ID NO: 198)

CTCGATTGTGCCGTCAACAAACCTGTGCTTGCAGAGGAAAGAGGATCTCAGAGAACAGAGATT  
ACCATGACTGTATGAATGTTGAGTGTCTCTAGAAAAATTACTACAGAACGGATAACTTGGCCAG  
ATCTGATGCAGAGAGTACAGCTGTCCACCTGGAAAGCTTGTAAAGTTAGCATTGGCATTGCAGGAGAGA  
AAGTATGCTATTGAAGATCTGAAAGATCAAACAGAAAATGATAGAGCATCTGAATTAGATGACAAGG  
AGTTAGTCAAAGAACAGCAGGTCATTAGAGCAACGTTGGTTTCAGCTTGAGGACCTCATTAAAAGGAA  
AATCCAAGTGTCACTCAGCAACTTGGAGGAGTTAAATGTTGTCAGTCCAGATTTAGGAGCTAATGGAG  
TGGGAGAACAGCAACACCAACATCGCCAGGGCTTAAGCAGAGGCCCTCTCCAGATATGGCTCAGA  
ACCTCTCATGGATCACCTGGCCATCTGAGTAACGGAGGAAAGCAGATGCTCTGAAATCGCTTAT  
AAAGGAGCAGACAGGGTCATGGCAGATCTGGTCTCAATGAGCAGACGGTCACTCCAGAAGGCTCTCT  
GATGCACAAAGCCACGTGAATTGTCAGTGAACCTAGTGGCCAGCGAAGAAAGTACTTAAACAAAGCCT  
TGTCCGAGAAAACCCAGTTCTCATGGCAGTGTCCAGGCCACCAGCCAAATTAGCAACATGAGCGAAA  
GATAATGTTCCGTGAACACATCTGTCGTTACAGATGATGTTGAGCAAACAAGTCAAAATGTAAGAGT  
GCACAAGCCAGCCTCAAGACTTACCAAAATGAAGTCAGTGGACTTGGGCCAGGGTCGCAACTATGA  
AGGAAGTCACAGAGCAGGAAAGAGTGAAGTGTGGAGCTTCAGGAATTGAGAGTGTCTATGACAG  
TGTGTTACAAAAGTGCAGTCACGGTTACAAGAAACTAGAGAAGATTGTTCTAGGAAGCATTAAAG  
GAAGATTGTATAAGCTTGGCCACTGGCTAAACAGCAGATATTGTTACATTCTGAAATCAACCTAA  
TGAATGAGAGTACTGAGCTCATACACAACTGGCTAAATACCAAAACACTCTGAAACATCTCCAGAATA  
TGAAAATCTCTACTTACGCTGAGAGAACCTGGCAGGACCATATTACCATCGCTGAATGAAAGTGGATCAT  
TCCCTACCTCAGTGGAAAGCTAAATGTTGCTCGAACATTTAATGTAATTGTTGCTTGGCTAAAGACA  
AGTTCTATAAAAGTCCAGGAAGCAATTCTGCTCGAAGGAATATGCTCTGATTGAGTTGACAACCCA  
GCTCTCAGTGAACCTGAAAGCCAAATTCTGAGGATGAGCAAAGTCCACCGACCTGGCGTTGAGGAG  
GCTCTTCTGCAAGATGTTGAGGCCATTCTGGACGAGGTGGCGGGCTTGGGGAGGGCGTGGATG  
AACTGAACCCAGAAAAAGAAGGTTTCTGAGCACAGGTCAGCCTGGCAGGCCAGACAAGATGCTGCACCT  
TGTCACTTATATCACAGGCTGAAGCAGAACAGAACAGAGGGTTAGCTTATTAGAAGACACCACAGT  
GCTTACCAAGAACAGAGAACATGTCAGTGGAGAGACAACAGTCAGTGTAAAAGAGGAGCAGT  
CCAAAGTGAATGAGGAAACGCTGCCCTGAGAGGAGAAGCTAAATGATCATCCCTGGCAGGAAGTCT  
CCAGGACTCAGGGATTGTACTGAAACAGAGTAACCATACATCTGAAAGATCTGGCCCCACACCTTGACCC  
TTGGCTTATGAGAAAGCCAGGATCAGATCCAGTCTGGCAAGGGGAGTTAAAAGTGTGACTCTGCCA  
TTGGTGAAGACGGTGACAGAATGTCAGAGGCCAATGGTGCAGAGTATAGACTTCCAGACTGAGATGAGTCG  
CTCCCTGGACTGGCTGAGGAGAGTGAAGGGCAGAGCTCAGTGGCCGGTGTACCTAGACCTCAACCTGCA

Figure 36 part - 110

GACATCCAAGAGGAAATCAGAAAATCAAATTCAAGGAAGAGGTCCAGTCCAGTTGAGAAATCATGA  
 ATGCGCTGAGTCACAAGGAAAGGAGAAGTTCACAAAGGCCAAGGGAGCTGATTTCTGGGATTAGAAC  
 CAGCCTCGCTGAGCTCTCAGAGCTGGATGGAGACATCCAGGAAGGCCCTACGCACCCAGACAGGCTACCTTG  
 ACTGAAATATAAGCCAGTGTCAAAGGTATTATCAGGTATTCAAGCAGCCAATGACTGGCTTGAGGATG  
 CCCAAGAAATGTTACAGCTGGCAGGCAATGGCTTAGACGTGGAGAGCGCAGAGGAAATCTCAAAGCCA  
 CATGGAATTTCAGTACAGAGGATCAGTTACAGTAAACCTGGAGGAGCTCCACAGCCTGGTAGCCACC  
 CTGGACCCCCTCATCAAGGCCAACGGCAAAGAAGACCTAGAACAGAAGTGGCTCTGGAAACTCAGGA  
 GCCAGAGGATGAGCCGGACTCTGGTCCCCAAGTGGATCTTGCAGAGATGCACAGCTCAATGGCACGA  
 TTACAGAGAAGAGGAAAGAGGTTATTGAATTGATGAATGATAAGAAAAGAAATTGTCAGTTGAGTTTCT  
 TTGTTGAAGACTTCGCTAGTCATGAAGCGGAAGAAAATTGTCAGAACACAAAGGCTTAGTGTAGTGG  
 TTAACCTTTCCATGAGAAAATTGTCAGGAAAAAGCTTCACAACAGGAGAAAACCGGAAATGA  
 TGCCAGCAAAGCCACCCCTGAGCAGGTCATGACCAACCGTCTGGCAGCGCTGGACGCCCTCGAGCTGTG  
 GCCCAGGACCAGGAGAAGATCCTGGAAGATGCAGTGGATGAGTGGACGGCTTAAACAACAAGGTTAAAA  
 AGGCCACTGAAATGATTGATCAGCTGCAAGATAAGTTACCTGGAAGTTCAGCAGAGAAGCATTGAAAGC  
 AGAGCTCTTAACCTTCTGAATACCACGACACCGTCTGGAGCTGGAGCAGCAGTCGGCCTTG  
 GGCATGCTGCCAGCAAACCCCTGAGCAGTGCCTCAGGATGGAGCCGCCCCAACCCCTGGGAAGAGCCTC  
 CGCTCATGCAGGAAATCACCGCCATGCAAGATCGGTGCTGAACATGCAGGAGAAGTGAAGACTAATGG  
 AAAGTTGGTGAAGCAAGAGCTGAAGGACCGAGAAATGGAGACTCAGATCAATTCTGTGAAATGTTGG  
 GTTCAGGAAAGGAAAGAAATTAGGAAATCCAAACATAGAAATAGATGCTCAACTTGAAGAACCTCAGA  
 TTCTCTTAACAGAAGCCAAATCACCGACAGAACATTGAAAAATGGAGAACAGAACAGAGGAGAAGTA  
 CTTAGGTCTTATACCATATTACCTCTGAACCTCTCAGTTGGCTGAAGTGGCTTAGATCTAAAG  
 ATCCGAGATCAGATCCAAGACAAAATAAGAAGTTGAGCAGAGCAAGGCCACGAGCCAGGAACCTCAGCC  
 GGCAAATTCAAGAGITAGCTAAAGACCTCACAACTATTCTAACTAAGCTGAAAGCGAACAGATAATGT  
 AGTCAAGCTAAACTGACCAAAAGGTGCTGGGAGAGGAATTAGATGGCTGAATTCAAAGTTAATGGAA  
 TTAGATGCAGCAGTACAGAAATTCTTGAACAGAACATTGCAACTGGGTAAGCCACTGGCAAGAACAGATAG  
 GAAAACGACTGAACCTCACCAGCAGACCATTAGACAAGCTGAGAACATGGCTCTCAAGCTCAATCAGGC  
 AGCATCACATTAGAAGAATACAATGAAATGCTGAATTAAATTGAAAGTGGATTGAAAAGCTAAAGTC  
 TTGCTCATGAACTATTGCTGAAATTCTGCAAGCCAGTCGGGAAACAATATATTGCTCATCAGGTAAC  
 CCTTAGGAAAATACTTTAAAGTAACCAAGGGCAATTGATTTACTGGGTAAGACTGACACAACAC  
 TTAGAGGGCTGTGATGAAAATTGGAGCTACCAGATAAAAGAACATGCTAAGGTAACCCCTAAGTTGTT  
 CAGTAGTTGGACAGAAAGGAGCTCTCATGAAATTGATGAAATTGAAATAAAATATCCTTGATCTTC  
 CCTAAACCTCTTAACACCAAGACCCAAACCATCAGGCTCTGAGAACCTCAGGCTCTGAGAACATTGTT  
 AATAATTATCTGCAGGGATCTGGTGGGAAATTCTTCTGTGAGAACATGCAATGAAGTGTGGAAAGATT  
 CTAGACTCCACACTCAGACTGGGGAAAACCAACCTCCGCATGCAAGGCTGTGTGATTGGAGCAGAA  
 TGCTTGGCTCTGTGAAATTCTGTCTCATGTTGATGAAAGACGTAATAATTGCTATTGAGAC  
 TTATGAGATCAAGTGGTTAAGGTACACACGTGAAACGTCGCTGGCACATGCAGGTGCTCAGTGGG  
 GATCTCCCGCCCTCCCTCAGCCCTCACCCAGGCTGTCACTGGCCTCCACAGGAGGTGGCAGCC  
 CAGAGCAAGCCATGAGTCACATCACATGCTGGTATGTTAGTTCACTTCTCTGAAGTTACATGAGAAA  
 AATGTTCTTTCTGTGAGTCACGTGTCATCCAGGAAATTATTCATCCTTGTGAACTTAAGCTAAATT  
 GACACAGATAGTTAATAGGCTAGTTATCATATAAAAATAGGGTGACTIONTATAGGAGTTACATGGG  
 TATCGAGTATTCTAGATTGTCCTTATATTGATGTTCTGCTTAAATGAAATCCCTGT  
 TTCCATTCTGTTACAGGGTCTAGATCAAAGCCTCATTGTTCTCTGATCAATTGCTGTTACAGCTTC  
 TAATTCTCTCTATATTCAACAGTCTCTCTGATCAATTGCTGTTACAGCTTCCTCCACAAATGCTTTCT  
 TAAGCAACTCCAATCTTGTCTTAAGATATGCTTAGATGAAACAGAACAGGACTTAAGTTACCACTGAT  
 TTGAAAACATGAAAAAGCCAAACATCCTTAGAAGTCTAGAAATGCAATTTCAGCAAAAAAGAGAGG  
 AAGAAAGACAAACTTAACTGTCACATCATACTGTTCTTCAGTTCAAGTTCAATTAAAGGAAGTGAAGAGCTC  
 TCAACATTCGCTGGTATCTGGTAAATCTCTTGTAAAAATAATTGCAAAATGTTGCTGTTACAGTCAA  
 AATGTTGCTACTCTGGGCACGTGCGGTGGCTCACACCTGAGTCCCAGCACTTGGGAGGGCAGGTGG  
 GTGGATCACAGGGTCAGGAGTTGGGACGGCTGGCCGGTATGGTGAAGCCCCATCTACTAGGAGTG  
 CAAAAGTCAGCTGGCGTGGTGGGCGCTGAGTCCCAGCTACTGGGAATCTGAGGCGGGAGAATC  
 GCTGAACTCGGGAGGTGGAGGTTGAGCAGCAAGATCATGCCACTGCACCTCAGCCTGGGTGACAGT  
 GAGACTCCATCTC

Human SYNE1 mRNA sequence - var17 (public gi: 20521661) (SEQ ID NO: 199)  
 GTGGATTCTCTAATGGAAATGTTATTCAAGAAGGATGAAGATAATATTAAAATCCATAGGTTACAA  
 GGCATTCTGAAATACCTCAGAAATATAAGGGTTAAGATAGACATTAACGCTGACAGTG  
 GATTTGTGAACCACTGGAGCAATGAAATAAAAGTTGGCAAATTCTGCAAGGTCTAGTAACAGGAGAT  
 CCAGCTGTTGAAAGGCTTATTGGAAATCTGGTCAAGAATATGAAAATAATGTAACATGCTGAAAACATGG  
 TTGAAAACCCAGGAAAGAGACTAAAACACAGCATGAAATTGGAGATCAGGCTCTGTTCAAAATGCA  
 TGAAAGACTGTCAGGATCTGGAAGATTGATTAAAGCAGAAAGAAAAGAGTGAAGAAAATTGAGCAGAA  
 TGGACTTGCTTGTGATTCAAGAACAGAAGAGACGTCAGTCACTGAGCAGCACAGTC  
 GGCAACACCTGGCAAATTAGATCACATGGTTGACAATTAAAGATACTGCTGAAATCAGTGTGCTTGACC

Figure 36 part - 111

AATGGAGTAGTCACAAAGTGGCCTTGACAAGATAAACAGTTACCTCATGGAGGCCAGATACTCTTT  
CCGATTCCGTCTGACTGGCTCTTAGAAGCTGTGCAAGITCAGGTGACAATCTCAGAATCTCAA  
GATGATCTGGAAAACAGGAAGGAGCTTACAGAAATTGGCTTACCAACCAATTATTAAGAGT  
GTCACCCACCGTGCAGAAACTCTTACCAATACACTGAAAGAAGTCAACATGAGATGGAATAACTGCT  
GGAAGAGATTGCTGAGCAGCTACAGTCAGCAAGGCCACTTCAGCTTGGCAAAGAGATAACAGGACTAC  
TCCAACAGTGTGCTCGACAGTTCAGCAGGAGGATCGAACCAATGAGCTGTGAAAGGCAGCACAA  
ACAAGGACATTGGATGAGTTGCCACATGGATTCAAGATTGCAACGACCTCTCAAAGGACTGGG  
CACAGTTAAAGATTCCCTTGTCTCATGAGCTGGAGAGCAACTGAAGCAACAAGTGGATGCTTCC  
GCAGCATCAGCTATTCAATCGGATCAACTCTTGTGAGTCACACTTGTGCCCCGGAGCAAGCTCT  
GCAAAACAGCAGACTTCATTACAGGCTGGAGTTCTTGATTATGAAACCTTGGCAAGAGTTAGAAGCTT  
GGAGGCCTGGATAGTGGAAAGCTGAAGAAATACTACAAGGGCAGGACCTAGGCCACTCATCTGACCTCTCC  
ACAATCCAGGAAAGGATGGAAGAACTTAAGGGACAGATGTTAAATTCAAGCAGCATGGCTCCAGATTAG  
ACCGTCTAAATGAGCTGGATATAGGTACCCCTGAATGATAAGGAAATCAAAAGAATGCAAGAATCTGAA  
CCGCCATTGGTCTGTGATCTCTCAGACTACAGAAAGATTCAAGCAGTGTGAGTCAGTCAGTCTTGTACAA  
CATCAGACTTTCTGGAAAAATGTGAAACATGGATGGAATTCTAGTTCAAGCAGACAAGAACAAAAGTTAGCAG  
TAGAGATTCAGGAAATTATCGACCTTTGGAAACAGCAGAGAGCACACAGGAGTTCAAGGCCAGAT  
GTTCACTGTCAGCAGATTGCACTCAATCATTATGATGGCAACGTTCTCTAGAACAGGTCAAGT  
GATGACAGGGATGAAATTCAACCTGAAATTGACACTCCTCAGTAATCAATGGCAGGGAGTGAATTGCAAGGG  
CCCAGCAGAGGGGGGAGTATTGACAGGAGATTGCACTGGCAGTGGCAGCGCTATAGGGAGATGGCAGAAA  
GCTTCGAAATGGTTGGAGTGTCTACCTCCCCATGAGTGGCTCCGAAGTGTCTTCTATACCACTG  
CAACAAGCAAGGACCCCTTTGATGAAGTGCAGTTCAAGAAAAGTGTCTCTGGCAACAAGGCAGCT  
ACATCCTGACTGTGGAGGTGGCAAGCAACTCCTCTCTGGCGGACAGTGGCGCTGAGGCCGCTTGCA  
GGCGAACCTCGCTGAAATCAAGAGAAATGAAATCAGCCAGCATGCGCTGGAAGAACAGAACAGAAA  
CTAGCCTTCTTGTGAAAGACTGGGAAAAATGTGAGAAAGGAAATAGCAGATTCCCTGGAGAAACTACGAA  
CTTCAAAAGAAGCTTTCGAGTCTCTCCCGATCACCAGAACAGAGCTCCATGCAAGAACAAATGCGTTG  
CAAGGAATTAGAAAATGCAAGTTGGGAGCTGGACAGATGACTTGACCCAGTTGAGCCTGCTGAAGGACACC  
CTCTCTGCTTATATCAGTGTGATGATATCTCCTTAAATGAAACCGTAGAGCTTCTGCAAAAGGCAGT  
GGGAAGAACTATGCCACAGCTCTCTTAAGGCGCAGCAAATAGGTGAAAGGATTGAAATGGCAGT  
CTTCAGTGAAGGAAACAAGGAACTCTGTGAGTGGTACTCAATGGAAAGGAAAGTCTCAGAATGG  
GACATTCTCATGAAAGAAATGATAGAGAAAGCTCAAGAAGGATTATCAAGGAAATGGCTATTGCTCAAG  
AGAACAAAATACAGCTTCAACAAATGGAGAACGACTGCTTAAGGCGCAGTAAAGCAAGAACATCTGA  
GATTGAATACAAGCTGGGAAAGGTCAACGACGGTGGCAGCATCTCTGACCTCATGGCAGCCAGGTG  
AAGAAGCTGAAGGAGACCCCTGGTAGCCGTGAGCAGCTGATAAGAACATGAGCAGCTGAGGCCCTGGC  
TCGCTCACATCGAGTCAAGCAGCTGGCCAAGCCAATAGTCTACGATTCTGTAACTCGGAAGAAATACAGAG  
AAAGCTTAATGAGCAGCAGGAGCTTCAGAGAGACATAGAGAACAGTACAGGTGTTGACATCTGCTC  
AACCTGTGTGAAGTCTGCTGACGACTGTGACGCCCTGCACTGATGCCAGTGTGACTCTACAGC  
AGGCTACGAGAACCTGGACCGGGCGTGGAGAAACATTGTGCTATGTCATGGAAAGGAGGCTGAAAAT  
CGAAGAGACGTGGCAGTTGGCAGAAATTCTGATGACTATTCACTGTTGAGATTGGCTGAAGTCT  
TCAGAAAGGACAGCTGCTTTCCAGCTTCTCTGGGTGATCTATACAGTTGCAAGGAAAGAACAAAGA  
AATTGAGGTTCCAGCGACAGGTCAACGAGTGCCTGACGCCAGCTGGAACTGATCAACAAAGCAGTACCG  
CCGCTGGCCAGGGAGAACCGCACTGATTCACTGAGCTGCTCAAACAGATGGTCAAGAACCGAAC  
AGATGGGACAACCTGCAAAAGCGTGTCACTCTCATCTGGCAGACTCAAGCATTATGGCAGCGTG  
AGGAGTTGAGACTGCGGGGACAGCATTCTGGCTGGCTCACAGAGATGGATCTGAGCTCAACTAATAT  
TGAACATTCTGAGTGTGATGTTCAAGCTAAATAAGCAACTCAAGGCTTCCAGCAGGAATTCA  
CTGAACCACAATAAGATTGAGCAGATAATTGCCAAGGAGAACAGCTGATAGAAAAGAGTGAAGGCCCTGG  
ATGCAAGCAGTACATGAGGAGGAACAGATGAGCTCCGACGGTACTGCCAGGGAGTCTCGGGCTGTGGA  
AAGATACCATAAGAAACTGATCCGCTGCCCTCCAGACGATGAGCAGCACCTCTCAGACAGGGAGCTG  
GAGCTGGAAAGACTCTGCACTGCTGCCAGCTGACTGGCACGCCCTGCAAGACAGCCTGCTTCTC  
CACAGCCTTCTCCAATCTCTCCCTCTGCTGCTCAGCCCCCTGGAGCGAGCGTCAAGGACAGAC  
CCCAGCTAGTGTGGACTCCATCCCCCTGGAGTGGGATCAGCACTATGACCTCAGTCGGGACCTGGAGTCT  
GCAATGTCCAGAGCTGCTGCCCTCTGAGGATGAAAGAGGTCAGGATGACAAAGATTCTACCTCCGGGAG  
CTGTTGCTTATCAGGGGACCAAGCTGCCCTAGAGTCACAGATGCCACAAGGGCAAGGCCCTGGATGA  
TAGCCGCTTCTGAGATACAGCAACCGAAAATATCATTGCAAGCTTCCAGGGGACAGGGAGCTAGAC  
ACCAGCTACAAAGGCTACATGAAACTGCTGGGCAATGCACTGAGCTATAGACTCCGTGAAGGAGCTGG  
AGCACAAAATGAGGAGGAAGAGGAGACGGCTTCTGGTTAACCTGCACTAGTACCGAACCCAAAC  
GGCTGGTGTGATTGACCGATGGGAGCTTCTCCAGGGCAGGATTGAGCAAGGAGTTGAGGATGAAGCAG  
AACCTCCAGAAGTGGCAGCAGTTAACCTGAGACTTGAACAGCATCTGGGCTGGCTGGGGGACACGGAGG  
AGGAGTTGGAACAGCTCCAGCGTCTGGAACCTGAGCACTGACATCCAGACCATCGAGCTCCAGATCAAAA  
GCTCAAGGAGCTCCAGAAAGCTGTGACGCCACCGCAAAGCCATCATCTCTCCATCAATCTGCAAGCCCT  
GAGTTCACTGCCAGGCTGACAGCAAGGAGAGGCCGGACCTGCAAGGATGCTGCAAGATGGCGCT  
GGGACCGAGTGTGCTCTGCTGGAGAGTGGGGGGCTGCTGCAAGGATGCCCTGATGCACTGCCAGGG  
TTTCCATGAAATGAGCCATGGTTGCTTATGCTGGAGAACATTGACAGAACAGGAAATTGAAATTGTC  
CCTATTGATTCTAACCTGATGCAAGAGATACTCAGGACCATCACAAACAGCTTATGCAAAATAAGCAGT

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PCT/US04/06308

AGCTGTTGGAATCCAACTCAGAGTAGCCTCTTGCAAGACATGTCTTGCACACTACTGGTGAATGCTGA  
AGGAACAGACTGTTAGAAGCCAAAGAAAAAGTCCATGTTATTGAAATCGGCTCAAACATTCTCTTGAAAG  
GAGGTCACTCGTCATATCAAGGAAGTGGAGAAGTTATTAGACGTGTCAGTAGTCAGCAGGATTGTCTT  
CCTGGTCTTCTGCTGATGAACTGGACACCTCAGGGCTGTGAGTCCCACATCAGGAAGGAGCACCCAAA  
CAGACAGAAAAGGCCACGAGGCAAGTGTAGTCTCTCACAGGCCGGACCCCTCTGTCAGCAGTCCACATAGC  
AGGTTCCACAAAAGGTGGCTCGGATTCCTCCCTTGAGGCCAGGGCAGGTCGGTCCGGCGGGCTTCC  
TGTTAGAGTCTCCGAGCAGCTTCTCCCTTGAGCTTCTCTGCTCTCATGGGCTTGCCCT  
TGTACCAATGTCAGAGGAAGACTACAGCTGTGCCCTCTCAACAACTTGTGCCGTCAATTCCACCCATG  
CTCAGATACACGAATGGCCCTCTCACTCTGAACTAAGCAGATGCCATCTGAGAAGTGTGGTAGCAT  
AAGGAGGATCGGGTCAAAAGCAATCCAAACTACCAACAAGAGGACCTGATCTGGCAAAGCCCTCGG  
TGTGGCAGCTTAGCCCTCTCAGATCACATGTGTCGAAATTATGGCTTCAGAGGTGGAAAGATAAACAG  
TGACGGGGAAACAAACAGACAACAAGAAGGTTGAAAGAAATCTGGTTGAGACTCTGAACCTTAGCACT  
AAGGAGATTGAGTAAGGACCTCAAAGTTCCCCGACTCATGAATTCTGGGCCCTGGCCCATCTGTGC  
ACAGCCAAGGACTTCAGTAGACCCTGGCAGCTTCCCCTGGTCTGCTCCAACCATCAGATAATGA  
CCCTCCAAGCACCAGTCAGTGTGTCATAATCTACCAACCAACAGTGTGTCAGAGGATTTAGAACCTT  
GTAACATACAATTTTAAGAGCTTATATGGCAGCTCCCTTACCTTGTGTTCTGGGCATGATGT  
TTAACCTTGTGTTAGAAGCACAAGCTGAAATCTAAAGGCACTTTTAGAGGTATAAAGAAAAAA  
CTAGATGTAATAAAGATCATGAAAGGCTTATGTGAAAAAAAGTGTGAATGTTAGT

Human SYNE1 mRNA sequence - var18 (public gi: 28195688) (SEQ ID NO: 200)  
TGTCTCACGGGGGGCCAGCTGGGCTTGACTGAGCAGGAGCTTCCATGGTCCACACGTAGTATGAC  
ATGTGACCTCTGCACATTGTTACAGTCTCAAACGTGATTCTTTCTGTGAAATAGTTATAATAGT  
AAGTGGCTACCAAGTAGAAAGTGGTCATGGGGGTGAAGGTTAACACAATAACGGACACACAGAACTTA  
CACAGGGCATTATGCCAAGCTATTGAAATATCTATATCCCTCACCTGCCGTCAATGTCAATGAAATA  
TTGACAATTCTACTCTAGACCTGCTAGAAGAATCCTAAAGAAATTGACAGTGAGCTGGAAAGCAATGACTGA  
GAAATTACAGTACCTCACTAGCGTGTACTGTACAGAAAAAATGTCTCAGCAAGTGGCAGAACTGGACGG  
GAGACTGAGGAGTTGCGACAGATGATCAAAATTGTTGAGAACCTCAAGATGCAAGCTAAGGATATGA  
AAAAATTGAAAGCAGAGTTACAAGCTGCTGGAGCAAGCCAGGCAACACTGACTTCTCC  
AGAAGTTGGACGCTCAGTCTCAAGGAGCAGCTCTCATGGCAGCATTGTTGTCAGATGGAGTC  
CTGAAGCCGAAGGTGCAAGCAGTGCAGCTCTGCCAGTGCCTCCGGATCCCCGAGGATGTGGTGC  
GCTTACCTCTGTCACTGCTCTGCCAGTGCAGGAAAGGCCAGCCGCTGCAGCACACCCCATCCA  
GCAGTGAACATCATGCAAGGAGCTGAGGATATGAAACAATATGAGCAAGAAATGAAACATCTCCAG  
CAAATGAGAAGGAGCTCACAGAGAGATTGAGGATAAAACCTGTTGCCACAGTAACATACAGGAGCTGC  
AGGCTCAGATTCTCGGCATGAGGAGCTGGCGAGAAAATTAAAGGCTACAGGAGCAGATCGCTTCTT  
GAATTCCAAGTGCAGATGTCAGTGAAGCAGAAAGCCACGCCACATGTCGTCAGGGTGCAGGAGGTC  
GAGGGGCTGCCGAAGGGACAGAGGACCTGGATGGGAGCTCTCCCCACGCCCTGGCCACCCCTCTG  
TGGCATGACTGCAGGCTGTCACACTTGTGTCACCGGTCACTGAGGAGCTGGGGAGGAGGG  
AACCAACAGTGAAGATTCTCCACCTGCCTGCTCGTCCCTTCACCTGTGCTAAACAGATGCTTCT  
GTTAACCAGGACATTGCAATTACCAAGCCTGTCGTCAGAGGTGCAAGACAGATGTCGAAATTC  
ACCCCAGCACATCCGCATCCCAGGAGTTCTATGAAACGGGATTGGAGCATCGCTACTGCCAACTGGG  
TGATTGCACTGGCTTGGGAAACCTTAAAGAATGTGATCAGTGAAGCAGCGCACACTCTATGAAGCT  
TTGGAGGCCAGCAGAAGTACAGGACTCCCTCAGTCCATCTCACGAAGATGGAGGCCATTGAGCTGA  
AACTCAGTGAAGAGCCCAGAGCCTGGCAGGAGTCCAGAAAGCCAGATGGCTGAACATCAGGATTGATGGA  
TGAGATTCTCATGCTCCAGGATGAAATCAATGAGCTCCAGTCTCTCGCAGAGGAGCTGGTATCCGAG  
TCTTGTGAGGCCAGCTGGGAGCAGCTGGCTTGAGCTCCACGCTCACGTCTTGTGAGGCCAGGAGA  
CCACCATCAGGATGAAAGCCTGGGAAACGGCAGCTTTGGAGGAGAAGTGAATGAGCTGGAGCAG  
ACAAAGGCAGGAACAGGCCCTGCAGAGGTATGCTGTGAAGCCAGATGGAGCTGGACAGCTGGCTTGGAGT  
ACCAAGGCCACTCTGGACACTGCGCTAGTCCACCCAGAGGCCATGGACATGGAGGCCAGCTTATGG  
ACTGCCAGAATATGCTGGTGGAAATAGAGCAGAAGGTGGTGTGTTTATCAGAACTGTCAGTCCACATGA  
GAACCTGCTGGAGGGCAAAGCTCACACCAAGGAGCAGGGCAGCAGCTGGCTGGAAAGCTGAGAAGG  
CTCAAGGGGAGCCTGCTGGAGCTGCAGAGAGCCCTGCATGATAAGCAGCTCAACATGCAAGGAAACAGCAC  
AGGAGAAGGAGGAGAGCGATGTTGACCTAACAGCCACGCAGAGGCCGGTCCAGGAATGGCTGGCCA  
AGCTGCACCATGGACCCAGCAGGGCAGAGCAGTCTCAGCAACAAAAGAGTTAGAACAGGAATTA  
GCCGAGCAGAAGAGTCTCTCGCTCAGTAGCCAGTCGAGGAGGAGATTCTAAATTCAACATTGGCGG  
CAGAGACCTGGTGATGCTGGGAAAAACCTGATGTTATCCCAGGAGTTGGGAGTGGAAAGGGAGAA  
ATCATCCGCTGAAGACCAGATGAGAATGAAATGGAAAGCCTACATCAAGAATTAGTACCAAGCAGAAA  
CTACTACAGAAATGTTCTGAAACAGGAACAAGAGCAAGTGTCTTATAGCAGGCCAAATCGACTCTGTCTG  
GTGTGCCACTGTACAAAGGGGACGTGCCACCCAGAGTGGAGGGGAAAGAGGCCAGAGTATAACACTTGGAGCAG  
GAACCAAGCCTCGAGGGAGTTCTAGGCCACCTCTACTTGTGTTGAGTGAAGAACGTTATTGTTGCCA  
CAGCACTTACAGAAGAAACAGAGACTTGTCTTCAACCAAGAGATTCTGCCAAAGACATTAAGGA  
AATGTCTGAAGAAATGGATAAGAACAAAATCTGTTTCCAAGCTTCCAGAGAATGGTGATAATCGA  
GATGTTATTGAAGATACTTGGGTTGTCTTGGCAGGTTATCCTGCTAGACTCAGTAGTGAATCAAC

Figure 36 part - 113

GATGTCATCAGATGAAAGAAAGACTTCAGCAAATACTAAATTCCAGAATGATCTGAAAGTGTGTTAC  
 ATCACTGGCTGACAACAAATACTCATTCGCAAAAATGGCAAATGTGTTGAACAGCCGTAGCAGAA  
 CAAATAGAGGCAATAACAACAGGCTGAAGATGGACTCAAAGAATTGATGCAGGAATCATTGAATTAAAGA  
 GGCGTGGTGACGAGCTACAGGTCAGCAGCCGTCCATGCAAGAACTCTCCAAGCTCCAGGACATGTATGA  
 TGAGCTGATGATGATCACTGGCTCCCGAGGAGTGGCTGTAATCAGAACCTTACACTCAAGAGTCAGTAT  
 GAGAGGGCCCTACAAGATCTGGCTGACTCTGCTAGAAAATGGTCAGGAGAAGATGGCAGGAGACCAGAAAA  
 TCATCGTGTCTTCCAAAGAGGAAATCCAGCAACCAACTTGACAAACATAAGGAATACTTCAGGGCCTGGA  
 ATCTCATATGATCTTGACTGAAACACTCTTCAGAAAGATAATCAGCTTGACTGAAACAGGGCTCACAGAGGGTGTGGAGCTGG  
 TTCCATACAGAGCTGATGGCTCAGGCTCTGCTGACTGAAACAGGGCTCACAGAGGGTGTGGAGCTGG  
 AGTACATTCTAGAGACGTGGTCCCCTGAGTGGAGGACAGCAGGAGCTCAGCAGACAGCTGGAGGTGGT  
 GGAAAGCAGCATCCAAAGCGTGGGTCTGGGAGGAAACGAGGACAGGCTATTGACCGCATAACACTC  
 TACAGCATTTAAATCTAGCCTTAATGAATACCAAGCCAAATTATATCAAGTATTAGATGATGGAAAC  
 GACTCTGATATCCATCAGCTGCTCAGATCTAGAAAGCCAACAAATCAACTTGGAGAGTGCTGGCTAAG  
 TAACACCAATAAAATGCTAAGGAACCTCACAGACTGAAACAAATTGAAACACTGGACCAAGATATCAA  
 AGTGAATCTGCAAGATCTAATTCACTGGTTACAATCTGCAAAAGACCGGCTAGAATTGAGCTCAGCAAT  
 CTGTCAGTCCCACAAGAGCTGGAAATGGTCCGTGATCATCTAAATGCTTCTGAGTCTGGAGTTCTAAAGA  
 AGTGGATGCCAATCTTCCCTGAAATCATCTGTTCTGAGTACTGAAATCAGCTCCTGACTAAAAAG  
 GTGGACACAGCACGCTGCGCTCTGAGTTGCGCATTGATAGCCAGTGGACTGACCTGCTAACCAATA  
 TCCCAGCCGTCAGGAGAAGCTCCACAGCTCCAGATGGATAAAACTGCCCCCATGCCATTCTGA  
 AGTCATGAGTTGGACTCTCTAAATGGAAAATGCTATTCTGAGGATTCAGAAAGGATGAAAGATAATTTAAATTCATA  
 GGTTACAAGGCAATTCTGAAATACCTTCAGAAATTAAGGGTTTAAGATAGACATTAACTGAAACAGC  
 TGACAGTGGATTGCTGAGCAACTTGAGCAATGAAATAAGGTTGGCAAAATTCTGCAAGGTCTAGTAAC  
 TAAGACTGATTTGCTGAGCAACTTGAGCAATGAAATAAGGTTGGCAAAATTCTGCAAGGTCTAGTAAC  
 GAGAAGATCCAGCTGTTGAGGTTATTGGAATCTGGTCAGAAATATGAAAATAATGACAATGCTGA  
 AAACATGGTTGAAACCCAGGAAAAGAGACTAAAACAACAGCATCGAATGGAGATCAGGCTCTGTTCA  
 AAATGCACTGAAAGACTGTCAGGATCTGGAAGATCTGATTAAGCAAAAGATAAAAGAAGTAGAGAAAATT  
 GACAGCAATGGACTTGTGTTGATTCAAGACCAAGAAAGACGTCTCTAGCATTGTCATGAGCACACTGC  
 GAGAGCTGGCCAAACCTGGCAAATTAGATCACATGGTGGACAATTAAAGATACTGCTGAAATCAGT  
 GCTTGACCAATGGAGTAGTCAGAACTGTCAGGCTTGCAGTAAAGGATAACAGTACCTCATGGAGCCAGATAC  
 TCTCTTCCCGATTCCGCTGACTGGCTCCTAGAAGCTGTGCAAGGTTAGGTGGACAATTCTCAGA  
 ATCTCCAAGATGATCTGGAAAAACAGGAAAGGAGCTTACAGAAAATTGGCTCTATCACCAACCAATTATT  
 AAAAGAGTGTACCCACCCGGTACAGAAAATCTTACCAATCACTGAAAGAAGTCAACATGAGATGGAAT  
 AACTTGCTGAGGAGATTGCTGAGCAGCTACAGTCCAGCAAGGCCCTACTTCAGCTTGGCAAAGATA  
 AGGACTCTCCAAACAGTGTGCTCGACAGTTCAAGCAGCAGGAGATGAAACCAATGAGCTGTTGAAGGC  
 AGCCACAAACAAGGACATTGCCGATGATGAGGTTGCCACATGGATTCAAGATTGCAACGACCTCTCAA  
 GGACTGGGACAGTTAAAGATTCCCTTTGTTCTCCATGAGCTGGAGAGCAACTGAGCAACAAGTGG  
 ATGCTTCCGACGATCAGCTATTCAATGGATCAACTCTTGTAGTCACACTTGTGTGCCCTGGAGCA  
 AGCTCTGCAAACAGCAGACTTCATTACAGGCTGGAGTTGATTATGAAACCTTGGCAAAGAGTTA  
 GAAGCTTGGAGGCTGGATAGTGGAGCTGAAGAAATACTACAAGGGCAGGACCCCTAGCCACTCATCTG  
 ACCTCTCCACAATCCAGGAAAGGATGGAAGAACTTAAGGGACAGATGTTAAATTCAAGCAGCATGGCTCC  
 AGATTAGACCGTCTAAATGAGCTTGATATAGGTTACCTTGAATGATAAGGAAATCAAAGAATGCAAG  
 AATCTGAACCGCATTGGTCTCTGATCTCCTCTCAGACTACAGAAAAGATTCAAGCAACTTGTGAGTCATT  
 TGCTACACATCAGACTTTCTGGAAAATGTGAAACATGGATGGAATTCTTAGTTGACAGACAGAAACAAAA  
 GTTAGCAGTAGAGATTTCAGGAAATTATCAGCACCTTTGGAACAGCAGAGAGCACAGGTTGTTCAA  
 GCCGAGATGTTCACTGCTCAGCAGATTGCACTTAATTGATGGCAACGTCAGTCTAGAACAAAG  
 GTCAAGTTGATGACAGGGATGAAATTCAACCTGAAATTGACACTCTCAGTAATCAATGGCAGGGAGTGAT  
 TCGCAGGGCCCAAGCAGAGGGGGGATCATTGACAGGCCAGATTGCCAGTGGCAGGCCATAGGGAGATG  
 GCAGAAAAGCTCGTAAATGGTTGGTGAAGTGTCTACCTCCCATGAGTGGCTCGGAAGTGTCT  
 TACCACTGCAACAAGCAAGGACCCCTTTGATGAAGTGCAGTTCAAAGAAAAGTGTCTGCAGCAACA  
 AGGCAGCTACATCCTGACTGTGGAGGCTGGCAAGCAACTCCTCTCGCGGAGCTGGCGTGGAGGCC  
 GCCTTGCAAGGCCAACTCGCTGAAATCCAAGAGAAAATGGAATCAGCCAGCATGCGCTGGAGAACAGA  
 AGAAAAAAACTAGCCTCTGGTGAAGGAACTGGGAAAATGTGAGGAAAGGAAATGAGCAGATTCCCTGGAGAA  
 ACTACGAACCTCAAAAAGAAGCTTCAGTCCAGTCTCCGGATCAGCAAGAGCTCCATGAGAACAA  
 ATGCGTTGCAAGGAATTAGAAAATGCACTGGAGCTGGAGATGACTCTGACCCAGTTGAGCCCTGCTGA  
 AGGACACCCCTCTGCTCTATCAGTGTGATGATATCTCCTTAAATGAAACGCGTAGAGCTCTGCA  
 AAGGAGTGGGAGAAACTGCAACGAGGAGCTCTGAGTGGTGAACATGGAAAGGATTGAATGAA  
 TGGCAGTCTCAGTGGAAAAGAACAAGGAACAGGAACTCTGAGTGGTGAACATGGAAAGCAGCT  
 AGAATGGAGACATTCTCATTGAGAAATGAGAGAGCTCAAGAAGGATTATCAAGAGGAAATTGCTAT  
 TGCTCAAGAGAAACAAATACAGCTCCAAACATGGAGAAGCAGACTTGCTAAAGCCAGCCATGAAAGCAA  
 GCATCTGAGATGAAATACAAGCTGGGAAAGGTCAACGACCGGTGGCAGCATCTCTGGACCTATTGAG  
 CCAGGGTGAAGAAGCTGAAGGAGACCCCTGGTAGCCGTGAGCAGCTTGTATAAGAACATGAGCAGCCTGAG  
 GACCTGGCTCGCTCACATCGAGTCAGAGCTGGCCAAGCAATAGTCTACGATTCTGTAACTCAGGAAAGAA  
 ATACAGAGAAAGCTTAATGAGCAGCAGGAGCTTCAGAGAGACATAGAGAAGCACAGTACAGGTGTTGCAT

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CTGTCCCTCAACCTGTGTGAAGTCCTGTCACGACTGTGACGCCGTGCCACTGATGCCGAGTGTGACTC  
TATACAGCAGGCTACGAGAAACCTGGACCGCGGGAGAAACATTGTGCTATGTCATGGAAAGGAGG  
CTGAAAATCGAAGAGAGCAGTGGCGATTGTGGCAGAAATTCTGGATGACTATTCACTGGTGG  
TGAAAGTCTTCAGAAAGGACAGCTGCTTTCCCAGCTCTCTGGGGTGAATCTACAGTTGCCAAGGAAGA  
ACTAAAGAAATTGTAGGCTTCAGCAGGTCCACGGACTGACGCTGAGCTGACGAGCTGGAACTGATCAACAG  
CAGTACCGCCGCTGGCCAGGGAGAACCGCACTGATTCACTGAGCTGACGCTCAAACAGATGGTCAAG  
GCAACCAGAGATGGGAAACCTGCAAAAGCGTGTACCTCCATCTGGCAGACTCAAGCATTTATTGG  
CCAGCGTGGAGGAGTTGAGACTGCGCAGGGAGACGATTCTGGCTGGCTCACAGAGATGGATCTGAGCTC  
ACTAATATTGAACATTCTGTAGTGTATCAAGCTAAAGCAACTCAAGGCCCTCCAGCAGG  
AAATTCACTGAACCAACAATAAGATTGAGCAGATAATTGCCAAGGAGAACAGCTGATAGAAAAGAGTGA  
GCCCTGGATGCAGCGATCATCGAGGGAGAACTAGATGAGCTCCGACGGTACTGCCAGGAGGTCTCGGG  
CGTGTGGAAAGATACCATAAAGAAACTGATCCGCTGCCCTCAGACGATGAGCAGCACCTCTCAGACA  
GGGAGCTGGAGCTGGAAAGACTCTGAGCTCTGTGGACCTGCACTGGCACGACCGCTCTGCAGACAGCCT  
GCTTCTCCACAGCCTCCCAATCTCTCCCTCGCTCGCTCAGGCCCTCCGGAGCGAGCGGTCAAGGA  
CGAGACACCCAGCTAGTGTGGACTCCATCCCCCTGGAGTGGATCACGACTATGACCTCAGTCGGGACC  
TGGAGTCTGCAATGTCCAGAGCTCTGCCCTCTGAGGATGAAGAAGGTCAAGGATGACAAAGATTCTACCT  
CCGGGGAGCTGTTGCCATTACAGGGGACCAAGTGGCCCTAGAGTCACAGATGCCAACACTGGGCAAAGCC  
CTGGATGATAGCCGCTTCAGATACAGCAACCGAAAATATCATTCTGCAGCAAACACTCCACGGGCCGG  
AGCTAGACACCCAGCTACAAGGCTACATGAAACTGCTGGGGCAATGCACTGAGTGGAGTATAGACTCCGTGAA  
GAGACTGGAGCACAAACTGAAAGGAGAGAGGAGAGGAGCTCTGGCTTTGTTAACCTGCATAGTACCGAA  
ACCCAAAGCGTGGTGTGATTGACCGATGGGAGCTCTCCAGGCCCAGGATTGAGCAAGGAGTTGAGGA  
TGAAGCAGAACCTCCAGAAGTGGCAGCTTAACTCAGACTTGAACAGCATCTGGGCTGGCTGGGGGA  
CACGGAGGAGGAGTTGAAACAGCTCCAGCGTCTGGAACACTGACATCCAGACCATCGAGCTCCAG  
ATCAAAAAGCTCAAGGAGCTCCAGAAAGCTGTGGACCACCGCAAAGCCATCATCTCCATCAATCTCT  
GCAGCCCTGAGITCACCCAGGCTGACAGCAAGGAGAGCCGGACCTGCAGGATGCTGTGAGATGAA  
TGGCGCTGGGACCGAGTGTGCTCTCTGCTGGAGGAGTGGGGGGCTGCTGCAGGATGCCCTGATGCAG  
TGCCAGGGTTCCATGAAATGAGCCATGGTTGCTTCTATGCTGGAGAACATTGACAGAAGGAAAATG  
AAATTGTCCCTATTGATTCTAACCTGATGCAAGAGATACTCAGGACCATCACAAACAGCTTATGCAAAT  
AAAGCATGAGCTGTTGAACTCCAACCTCAGAGTAGCCTCTTGCAAGACATGCTTGGCAACTACTGGTG  
AATGCTGAGGAAACAGACTGTTAGAGCAAAGAAAAAGTCATGTTAGACGCTGTCAAGTAGTCAGCAGGA  
TCTTGAGGAGGTCAGTCGTCAATATCAAGGAACCTGGAGAGTGGCTCTCTGAGCTCTCTGCTCCTCATCGGGCTT  
ACCCCAAACAGACAGAACAGCCACGAGGAAGTGTAGTCTCTCACAGCTGGACCCCTGTCAGCAGTC  
CACATAGCAGGTCACAAAGGTGGCTCGATTCTCCCTTCTGAGCCAGGGCCAGGTCGGTCCGGCCG  
CGGCTTCTGTTCAAGACTCTCCAGCAGCTCTCCCTCTGAGCTCTCTGCTCCTCATCGGGCTT  
GCCCTGCTTGACCAATGTCAGAGGAAGACTACAGCTGTGCCCTCTCCAACAACCTTGGCCGGTATTCC  
ACCCCATGCTCAGATAACAGAATGCCCTCCACTCTGAACTAAGCAGATGCCATCTGCAGAAGTGCT  
GGTAGCATAGGAGGATGGGTATAAGCAATCCAAACTACCAACAAGAGGACCTTGATCTTGGCGAAA  
GCCCTGGTGTGGCAGCTTACGGCCCTCCAGATCACATGTTGCAAAATTATGGCTTCAAGAGGTTGGAAG  
ATAAACAGTGAAGGGGAAACAAACAGACAACAAGAAGGTTGGAAGAAATCTGGTTGAGACTCTGAACC  
TTAGCACTAAGGAGATTGAGTAAGGACCTCCAAAGTCCCCGACTCATGAAATTCTGGCCCTTGGCCCA  
TTCTGTGACAGGCCAAGGACTTCAGTAGACCATCTGGGAGCTTCCCATGGTGTGCTCCAACCATCAG  
ATAAAATGACCCCTCCAAAGCACCACATGTCAGTGTGCTACAATCTACCAACAAACAGTGTGAAGAGATT  
AGAACCTTGTAAACATCAAAATTGAGCTTATGGCAGCTTCTTACCTTGTGTTCTGGGG  
CATGATGTTAACCTTGTGTTAGAAGCACAAGCTGAAATCTAAAAGCAGCTTTTTAGAGGTATA  
AAGAAAAACTAGATGTAATAAGATCATGGAGGCTTATGTGAAAAAGTTGAATGTTAGT

Human SYNE1 mRNA sequence - var19 (public gi: 28195676) (SEQ ID NO: 201)  
CAAGGGGAAACTTCTACCCCCACGCAAGGTTATAGCTTTGTCTGCAAGAGTCTAACCTTGCAAGTGG  
AGCTTCATGGGGTGGCGAGGACCTGAGTGCCTGAGGATGGCAGAGGACGGCTGTGGATGCAAGATC  
TCCAGATTGTAACCTGCGATGTCACAAGGGCCAGGGTGAAGAAGACTGAAAGGAGACCTGGTAGCCGTGCA  
GCAGCTTGATAAGAACATGAGCAGCCTGAGGACCTGGCTCGTCACATCGAGTCAGAGCTGGCAAGCCA  
ATAGTCTACGATTCTGTAACCTGGAAAGAAATACAGAGAAAGCTTAATGAGCAGCAGGAGCTCAGAGAG  
ACATAGAGAACAGTACAGGTGTTGCATCTGCTCAACTGTGAGTCTCTGTCAGCAGACTGTGA  
CGCCTGTCACACTGATGCCAGTGTGACTCTATACAGCAGGCTACGAGAAACCTGGACGGCGGTGGAGA  
AACATTGTGCTATGTCATGGAAAGGAGGCTGAAAATCGAAGAGAGCTGGCGATTGTGGAGAAAATTTC  
TGGATGACTATTCACTGGCTTGAAGATGGCTGAAGTCTCAGAAAGGACAGCTGCTTTCCAGCTCTTC  
TGGGTGATCTATACAGTGTGCAAGAACACTAAAGAAAATTGAGGCTTCCAGCGACAGGTCCACGAG  
TGCCTGACGCACTGGAAACTGATCAACAAAGCAGTACCGCCGCTGGCAGGGAGAACCGCACTGATT  
CATGTAGCTCAAAACAGATGGTTCAAGAAGGCAACCGAGATGGGACAAACCTGCAAAAGCGTGTACCTC  
CATCTGGCAGACTCAAGCATTATTGGCCAGCGTGAAGGAGTTGAGACTGCGGGACAGCATTCTG  
GTCTGGCTCACAGAGATGGATCTGCACTTAATATTGACACATTCTGAGTGTGATGTTCAAGCTA  
AAATAAGCAACTCAAGGCCCTCCAGCAGGAAATTCACTGAACCACAATAAGATTGAGCAGATAATTGC

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CCAAGGAGAACAGCTGATAGAAAAGAGTGAGCCCTGGATGCAGCGATCATCGAGGAGGAACTAGATGAG  
CTCCGACGGTACTGCCAGGAGGTCTCGGGCGTGTGGAAAGATACCATAAGAAACTGATCCGCGCTGCCTC  
TCCCAGACGATGAGCACGACCTCTCAGACAGGGAGCTGGAGCTGAAGACTCTGCAGCTCTGTCGGACCT  
GCACTGGCACGACCGCTCTGCAGACAGCCCTGCTTCTCCACAGCCTCCCAATCTCTCCCTCTCGCTC  
GCTCAGCCCCCTCCGGAGCAGCGGTCAAGGAGACACCCAGCTAGTGTGGACTCCATCCCCCTGGAGT  
GGGATCACGACTATGACCTCAGTCGGGACCTGGAGCTGTGCAAGAGCTCTGCCCTCTGAGGATGA  
AGAAGGTCAGGATGACAAGAATTCTACCTCCGGGAGCTGTGCTTATCAGATGTAATGATCCCCGAA  
AGCCTGAGGCCATGTAACAGAAAATGCAATCAAAATACCTCCGGGACACAGTGCCTAG  
AGTCACAGATCCGACAACCTGGCAAGGAGCTGGATGATAGCCGTTACAGATACAGCAAACCGAAAATAT  
CATTGCAGCAAACCTCCCACGGGCCGGAGCTAGACACCCAGCTACAAAGGCTACATGAAACACTGCTGGC  
GAATGCAGTAGCAGTATAGACTCCGTCAGAGACTGGAGCACAACACTGAAGGAGGAAGAGGAGAGCCTC  
CTGGCTTGTAAACCTGCATAGTACCGAAACCCAAACGGCTGGTGTGATTGACCGATGGGAGCTTCTCCA  
GGCCCAGGCATTGAGCAAGGAGTTGAGGATGAAGCAGAACCTCCAGAAGTGGCAGCAGTTAACTCAGAC  
TTGAACAGCATTGGGCTGGCTGGGAGACCGAGGAGGAGTTGAAACAGCTCCAGCTCTGAACTCA  
GCACTGACATCCAGACCATCGAGCTCCAGATCAAAAAGCTCAAGGAGCTCCAGAAAGCTGTGGACCACCG  
CAAAGCCATCATCCTCTCCATCAATCTCTGCAGCCCTGAGTTCACCCAGCTGACAGCAAGGAGAGCCGG  
GACCTGCAGGATCGCTTGCGAGATGAATGGGCGTGGGACCGAGTGTGCTCTGCTGGAGGAGTGGC  
GGGGCCTGCTGCAGGATGCCCTGATGCAGTGCAGGCCAGGGTTCCATGAAATGAGCCATGGTTGCTTCT  
GCTGGAGAACATTGAGCAGAAGGAAAATGAAATTGCTCTTATGATTCTAACCTTGATGAGAGATACTT  
CAGGACCATCACAAACAGCTTATGCAAAATAAAGCATGAGCTGTGAAAGAACAGACTGTTAGAAGC  
CCATGTTATTGAAATCGGCTCAAACCTCTTGAAGGAGGTCAAGTCGTATATCAAGGAACACTGGAGAAG  
TTATTAGACGTGTCAGTAGTCAGCAGGATTGCTCTGCTCTGCTGATGAACTGGACACCTCAG  
GGCTGTGAGTCCCACATCAGGAAGGAGCACCCAAACAGACAGAAAAGCCACGAGGCAAGTGTAGTCT  
CTCACAGCCTGGACCCCTGTCAGCAGTCCACATAGCAGGTCACAAAGGTTGGCTCCGATTCCCT  
TCTGAGCCAGGGCCAGGTCCGGTCCGGCTCCGTACAGGTCAGAGTCCTCCAGCAGCTCTCCCT  
AGCTTCTCCTGCTCCTCCTCATCGGGTTGCTGCCCTGCTTGTACCAATGTCAAGAGGAAGACTACAGCTGTG  
CCTCTCCAACAACCTTGGCCGGTCAITCCACCCCATGTCAGATACACGAATGGCCCTCCACTCTGA  
ACTAAGCAGATGCCATCTGCAGAAGTGTGGTAGATAAGGAGGATCGGGTCATAAGCAATCCCAAAC  
CCAACAAGAGGACCTTGATCTGGCGAAAGCCCTCGGTGTGGCAGCTTAGCCCTCCAGATCACATG  
TGTGCAAATTATGGCTTCAGAGTGGAAAGATAAACAGTGCAGGGGGAAACAAACAGACAACAAGAAG  
GGAAGAAATCTGGTTGAGAAGCTCTGAACCTTAGCAAGGAGATTGAGTAAGGACCTCCAAAGTCCCC  
GGACTCATGAATTCTGGGCTTGGCCATTCTGTGACAGCCAAGGACTTCAGTAGACCATCTGGCAG  
CTTCCCCTGGCTGCTCCAAACATCAGATAATGACCCCTCCAGCACCAGTCAGTGTGTCACAATC  
TACCAACCAACAGTGTGAAGAGATTAGAACCTTGTAAACATACAATTAAAGAGCTTATATGGCAG  
CTTCCCTTTTACCTTGTGTTCTGGCATGTTAAACCTTGTGTTAGAACAGCACAAGCTGTAAA  
TCTAAAAGGCACTTTTTAGAGGTATAAGAAAAACTAGATGTAATAAAAGATCATGGAAGGCTTT  
ATGTGAAAAAGTTGAATGTTAGT

Human SYNE1 Protein sequence - var1 (public gi: 21753085) (SEQ ID NO: 295)  
M V V D D L F E D M K D G V K L L A L L E V L S G Q K L P C E Q G R R M K R I H A V A N I G T A L K F L E R K I K L V N I N S T D I A D G  
R P S I V L G L M W T I I L Y F Q I E E L T S N L P Q L Q S L S S A S S V D S I V S S E T P S P P S K R V T T K I Q G N A K K A L L K W  
V Q Y T A G K Q T G I E V K D F G K S W R S G V A F H S V I H A I R P E L V D L E T V K G R S N R E N L E D A F T I A E T E L G I P R L L D  
P E D V D V D K P D E K S I M T Y V A Q F L K H Y P D I H N A S T D G Q E D D E I L P G F P S F A N S V Q N F K R E D R V I F K E M K V W I  
E Q F E R D L T R A Q M V E S N L Q D K Y Q S F K H F R V Q Y E M K R K Q I E H L I Q P L H R D G K L S L D Q A L V K Q S W D R V T S R L F  
D W H I Q L D K S L P A P L G T I G A W L Y R A E V A L R E E I T V Q V Q V H E E T A N T I Q R K L E Q H K D L L Q N T D A H K R A F H E I Y  
R T R S V N G I P V P P D Q L E D M A E R F H V S T S E L H L M K M F E L K Y R R L L S L L V L A E S K L K S W I I K Y G R R E S V E  
Q L L Q N Y V S F I E N S K F F E Q Y E V T Y Q I L K Q T A E M Y V K A D G S V E E A E N V M K F M N E T T A Q W R N L S V E V R S V R S M  
L E E V I S N W D R Y G N T V A S L Q A W L E D A E K M L N Q S E N A K D F P R N L P H W I Q Q H T A M N D A G N F L I E T C D E M V S R  
D L K Q Q L L L N G R W R E L F M E V K Q Y A Q A D E M D R M K K E Y T D C V V T L S A F A T E A H K K L S E P L E V S F M N V K L L I Q  
D L E D I E Q R V P V M D A Q Y K I I T K T A H L I T K E S P

Human SYNE1 Protein sequence - var2 (public gi: 19584385) (SEQ ID NO: 296)  
K L L I Q D L E D I E Q R V P V M D A Q Y K I I T K T A H L I T K E S P Q E E G K E M F A T M S K L K E Q L T K V K E C Y S P L L Y E S Q Q  
L L I P L E E L K Q M T S F Y D S I L G K I N E I I T V L E R E A Q S S A L F K Q K H Q E L L A C Q E N C K K T L T L I E K G S Q S V Q K F  
V T L S N V L K H F D Q T R L Q R O I A D I H V A F Q S M V K K T G D W K K H V E T N S R L M K K F E E S R A E L E K V L R I A Q E G L E E  
K G D P E E L L R R H T E F F S Q L D Q R V L N A F L K A C D E L T D I L P E Q E Q Q G L Q E A V R K L H K Q W K D L Q G E A P Y H L L H L  
K I D V E K N R F L A S V E E C R T E L D R E T K L M P Q E G S E K I I K E H R V F F S D K G P H L C E K R L Q L I E E L C V K L P V R D  
P V R D P G T C H V T L K E L R A I D S T Y R K L M E D P D K W K D Y T S R F S E F S S W I S T N E T Q L K G I K G E A I D T A N H G E  
V K R A V E E I R N G V T K R G E T I S W L K S R L K V L T E V S S E N E A Q K Q G D E L A K L S S F K A L V T L L S E V E K M L S N F G  
D C V Q Y K E I V K N S L E E L I S G S K E V Q E Q A E K I L D T E N L F E A Q Q L L H H Q Q K T K R I S A K K R D V Q Q Q I A Q A Q Q G  
E G G L P D R G H E E L R K L E S T L D G L E R S R E R Q E R R I Q V T L R K W E R F E T N K E T V V R Y L F Q T G S S H E R F L S F S S L

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ESLSSELEQTKEFSKRTEIASVQAEVLKEASEIPLGPQNQKQLLQQQAKSIKEQVKKLEDTLEEDIKPME  
MVTKWDHFGSNFETLSVWITEKEKEELNALETSSSAMDMQISQIKVTIQEIESKLSSIVGLEEEEQSFAQ  
FVTGESARIKAKLTQIRRYGEELREHAQCLEGITLGHLSQQQKFEENLRKIQQSVSFEDKLAVPIKIC  
SSATETYKVLQEHMDLCQALESLSSAITAFSASARKVVNRDSCVQEAAALQQYEDILRRAKERQTALEN  
LLAHQRLEKELESSLFTWLERGEAKASSPEMDISADRKVVEGELQLIQASSRKCEEGKNKMLFVTVLFK  
IIK

Human SYNE1 Protein sequence - var3 (public gi: 17861378) (SEQ ID NO: 297)  
MGERLAKASHESKASEIEYKLGKVNDRWQHLLDLIAARVKKLKETLVAVQQLDKNMSSLRTWLAHIESEL  
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RWRNICKAMSERRLKIEETWRLWQKFLLDDYSRFEDWLKSSERTAAFPSSSGVIYTVAKEELKKFEAFQRQ  
VHECLTOLELINKQYRRLARENRTDSACSLQKMVHEGNQRWDNLQKRVTSILRRLKHFIGQREEFETARD  
SILWLTEMQDQLTNIEHQSACDVQAKIKQLKAQQEISLNHINKIEQIIAQGEQLIEKSEPLDAAIIEEE  
LDELLRRCQEVFGVRVERYYKKLIRLPPLPDDDEHDLSDRELELEDSAALSDLHWHDRSADSLLSPQPSSNLS  
LSLAQPRLRSERSGRDTPASVDSIPLWEWDHDYDLSRDLESAMSRALPSDEEGQDDKDFYLRGAVALSDVM  
IPESPEAYVKTENAIKNTGDHSALESQIRQLGKALDDSRFQIQQTENIIRSKTPGPELDTSYKGYM  
LLGECSSSIDSVKRLEHKLKEEEESLPGFVNHLSTETQTAGVIDR WELLQAOQALKELRMKQNLQWQF  
NSDLNSIWAWLGDTEEELQQLRLELSTDQTIELQIKKLKELQKAVDHRKAIILSINLCSPEFTQADSK  
ESRDLQDRLSQMNNGRWDRCVSLLEEWRGQLDAMQCQGFHEMSHGLLLMLENIDRRKNEIVPIDSNLDA  
EILQDHHKQLMQIKHELLESQLRVASLQDMSCQLVNAEGTDCLEAKEKVHVIGNRIKLLLKEVSRIKE  
LEKLLDVSSSQDLSWSADELDTGSVSPSGRSTPNRQKTPRGKCSLSQPGPSVSSPHSRSTKGSD  
SSLSEPGRSGRGFLFRVLAALPLQLLLLLIGLACLVPMSEEDYSCALSNNFARSFHPMLRTNGPP  
PL

Human SYNE1 Protein sequence - var4 (public gi: 17861386) (SEQ ID NO: 298)  
MELDAAVQKFLEQNGQLGKPLAKKIGLTELHQQTIRQAENRSLKLNQATSHLEEYNEMLELILKWIEKA  
KVLAHTIAWSASQLRKQYILHOTLLEESKEIDSELEAMTEKLQYLTSVYCTEKMSQQVAELGRETEEL  
RQMICKRLQNLQDAAKDMKKFEAELKKLQAALEQAAQATLTSPEVGRLSLKEQLSHRQHLLSEMESLKP  
QAVQLCQSAALRIPEDVVASLPLCHAALRLQEEAASRLQHTAIQCNIMQEAVVQYEQYEQEMKHLQQLIEG  
AHREIEDKPVATSNIQLQAIKSHEELAQKIKGYQEIQIASLNSKCKMLTMKAKHATMLLTVEGLAE  
GTELDGELLPTPSAHPSPVMMTAGRCTLLSPVTEESGEEGTNTSEISSPPACRSPSPVANTDASVNQDI  
AYYQALSAERLQTDAAKIHPSTSASQEFYEPGLEPSATAKLGDLQRSWETLKNVISKEQRTLYEALERQQ  
KYQDSLQSISTKMEAIELKLSSESPEPGRSPSPESQMAEHQALMDEILMLQDEINELQSSLAEELVSESC  
PAEQLALQSTLTVELAERMSTIRMKASGKROLLEELNDQLEEQRQEALQRYRCEADEELDSWLLSTKATL  
DTALSPPKEPMDMAEQLMDCQNMVIEQKVVALESELVHNENLLLEGKAHTKDEAEQLAGKLRKGSL  
LELQRALHDKQLNMQGTAQEKEESDVDTATQSPGVQEWAQRTTWQQRQSSLQQQKELEQELAEQKS  
LLRSVASRGEEILIQHSAETSGDAGEKPDVLSQELGMGEKEKSSAEDQMRMKWESLHQEFSTKQKLLQNV  
LEQEQQVLYSRPNRLLSGVPLYKGDVPTQDKSAVTSLLDGLNQAFEEVSSQSGGAKRQSIHLEQKLYDG  
VSATSTWLDDVEERLFVATALLPEETETCLFNQEILAKDIKEMSEEDMKNKNLFSQAFPENGNDRVIED  
TLGCLLGRISLLDSVNVNQRCHQMKERLQQILNFQNDLKVLFTSLADNKYIILQKLANVFEQPVAEQJEA  
QQAEDGLKEFDAGIIELKRRGDELVEQPSMQELSKLQDMYDELMMIIGSRRSGLNQNLTLKSOYERALO  
DLADLLETGQEKMAGDQKIIIVSKEEIQQPLDKHKEYFQGLESHEMILTVTLFRKIIISFAVQKETQFTEL  
MAQASAVLKRAHKRGVELEYILETWSHLDDEDQQELSRQLEVVESSIIPSVGVLVEENEDRLIDRITLYQHLK  
SSLNEYQPKLYQVLDLGKRLLISISCSDLESQNLQGECWLSNTNMSKELHRLETILKHTRYQSESAD  
LIHWLQSAKDRLEFWTQQSVTVPQELMVRDHLNNALEFSKEVDAQSSLKSSVLSTGNQLLRLKKVDTAT  
LRSELSRIDSQWTDLNTNIPAVQEKLHQLMQDKLPSRHAISEVMSWTSIMENAIQKDEDNIKNSIGYKAI  
HEYLQKYKGFKIDINCKQLTVDFVNQSVLQISSQDVESKRSKDFAEQLGAMNKSQILQGLVTEKIQL  
LEGLLLESWEYENNVCQCLKTWFETQEKRLKQQHIGDQASVQNALKDQDLEDLIKAKDKEVEKIEQNL  
ALIQTKKEDVSSIVMSTLRELQGTWANLDHMVGQLKILLKSVLDQWSSHKVAFDKINSYLMEARYSLSRF  
RLLTGSLEAVQVQVDNLQNLQDDLEKQERSLQKFGSITNQLLKECHPPVTETLNTLKEVNMRWNLL  
IAEQLQSSKALLQLWQRYKDYSKCASTVQQQEDRTNELLKAATNKDIADDEVATWIQDCNDLLKGLGTV  
KDSLFVLHELGEQLKQODVASAASAIQSDQLSLSQHLCALEQALCKQQTSLQAGVLDYETFAKSLEALEA  
WIVEAEELQGQDPHSSDLSTIQERMEELKGQMLKFSSMAPDILDRNLNGYRLPLNDKEIKRMQNLNRH  
WSLISSQTTERFSKLQSFLLQHQTGLEKCETWMEFLVQTEQKLAVEISGNYQHLLLEQQRHAEHLFQAEMFS  
RQQLHSIIIDGQRLLEQGVQDDRDEFNLKLTLLSNQWQGVIRRAQQRRGIIDSQIRQWQRYREMAEKL  
KWLVEVSYLPMSGLGSVPILQQARTLFDEVQFKEKVFLRQQGSYILITVEAGKQLLLSADSGAEEAALQAE  
LAEIQEKKWSASMRLEEQQKKLAFLLKDWEKCEKGIAADSLEKLRFTKKLQSLSQSLPDHHEELHAEQMRCKE  
LENAVGWSWTDDLTQLSLLKDTLSAYISADDISILNERVELLQRQWEELCHQLSLRRQQIGERLINEAVFS  
EKNKELCEWLTOMESKVSQNGDILIEEMIEKLKKDYQEEIAIAQENKIQQLQOMGERLAKASHESKASEIE  
YKLGVNDRWQHLLDLIAARVKKLKETLVAVQQLDKNMSSLRTWLAHIESELAKPIVYDSCNSEEIQRK  
NEQQELQRDIEKHSTGVASVNLCEVLLHDCDACATDAECDSIQQATRNLDRRWRNICKAMSERRLKIEE  
TWRLWQKFLDDYSRFEDWLKSSERTAAFPSSSGVIYTVAKEELKKFEAFQRQVHECLTQLELINKQYRRL

ARENRTDSACSLKQMVHEGNQRWDNLQKRVTSILRRLKHFFIGQREEFETARDSILVWLTEMDSLQLTNIEHFSECDVQAKIKQLKAFFQQEISLNHNKIEQIIAQGEQLIEKSEPLDAAIIEEELDELRYCQEVFGRVERYHKKLIRLPLPDDEHDLSDRELELEDASAALSDLHWDRSADSILSPQPSSNLSLSLAQPLRSERSGRDTPASVDSIPLWDHDYDLSRDLESAMSRAALPSDEEGQDDKDFYLRGAVALSGDHSalesQIRQLGKALDDSRFQIQQTENIIRSCKPTGPPELDTSYKGYMKLGECSSSIDSVKRLEHKLKEEEESLPGFVNLMHSTETQTAGVIDRWELLQAQALSKELRMKQNLQWQFNSDLSIWAFLGDTEEELEQLQRLELSTDIDTIELQIKKLKELQKAVDHRKAIILSINLCSPEFTQADSKESRDLQDRLSQMNGRWDRCVSLLEWRGLLQDALMQCQGFHEMSHGLLMLENIDRRKNEIVPIDSNLDAEILQDHHKQLMQIKHELLESQRLVASLQDMSCQLLVNAEGTDCLEAKEKVHVIGNRLKLLKEVSRRHIKELEKLLDVSSSQDLSWSSADELDTSGSVSPTSGRSTPNRQKTPRGKCSLSQPKTPRGKCSLSQPGPSVSSPSRSTKGGSDSSLSEPGPGRSGRGLFRVLRAALPLQLLLLLIGLACLVPMSEEDYSCALSNNFARSHFPMRLRTNGPPPL

Human SYNE1 Protein sequence - var5 (public gi: 17227154) (SEQ ID NO: 299)  
MRLEQKKKLAFLKDWEKEKGIAADSLEKLRTFKKKLQSPLDHHEELHAEQMRCKELENAGSWTDDL  
TQLSLLKDTLSAYISADDISILNERVELLQRQWEELCHQSLRRQQIGERLNEWAVFSEKNKELCEWLQ  
MESKVSQNGDILIEEMIEKLKKDYQEEIAIAQENKIQLOQOMGERLAKASHESKASEIEYKLGKVNDRWQH  
LLDLIAARVKKLKETLVAVQQQLDKNMSSLRTWLAHIESELAKPIVYDSCNSEEIQRKLNNEQQELQRDIEK  
HSTGVASVNLCEVLLHDCACATDAECDSIQQATRNLDRRWRNI CAMSMERRLKIEETWRLWQKFLLDDY  
SRFEDWLKSERTAAFPSSSGVIYTVAKEELKKFEAFQROVHECLTQLELINKQYRRLARENRTDSACSL  
KQMVHEGNQRWDNLQKRVTSILRRLKHFFIGQREEFETARDSILVWLTEMDSLQLTNIEHFSECDVQAKIKQ  
LKAFOQQEISLNHNKIEQIIAQGEQLIEKSEPLDAAIIEEELDELRYCQEVFGRVERYHKKLIRLPLPDD  
EHDLSDRELELEDASAALSDLHWDRSADSLLSPQPSSNLSLSLAQPLRSERSGRDTPASVDSIPLWDHD  
YDLSRDLESAMSRAALPSDEEGQDDKDFYLRGAVALSGDHSalesQIRQLGKALDDSRFQIQQTENIIRS  
KTPTPPELDTSYKGYMKLGECSSSIDSVKRLEHKLKEEEESLPGFVNLMHSTETQTAGVIDRWELLQAQAL  
LSKELRMKQNLQWQFNSDLSIWAFLGDTEEELEQLQRLELSTDIDTIELQIKKLKELQKAVDHRKAI  
LSINLCSPEFTQADSKESRDLQDRLSQMNGRWDRCVSLLEWRGLLQDALMQCQGFHEMSHGLLMLEN  
IDRRKNEIVPIDSNLDAEILQDHHKQLMQIKHELLESQRLVASLQDMSCQLLVNAEGTDCLEAKEKVHV  
GNRLKLLKEVSRRHIKELEKLLDVSSSQDLSWSSADELDTSGSVSPTSGRSTPNRQKTPRGKCSLSQPK  
GPSVSSPSRSTKGGSDSSLSEPGPGRSGRGLFRVLRAALPLQLLLLLIGLACLVPMSEEDYSCALS  
NFARSHFPMRLRTNGPPPL

Human SYNE1 Protein sequence - var6 (public gi: 12698057) (SEQ ID NO: 300)  
QRKLEQHKDQLQNTDAHKRKFHEIYRTRSVNGIPVPPDQLEDMAERFHVSSTSELHLMKMEFLELKYL  
LSLLVLAESKLKSWIICKYGRRESVEQLLQNYVSFIENSKFFEYEVTYQILKQTAEMYVKADGSVEEAEN  
VMKFMNETTAQRWNLSVEVRVSRSMLLEEVISNWDRYGNVTASLQAWLEDAEKMLNQSENAKDFFRNLP  
WIQQHTAMNDAGNFLIETCDEMVSRLKQQLLLLNGRWRRELPMEVKQYAQADEMDRMKEYTDCVVTLSA  
FATEAHKKLSEPLEVSFMNVKLLIQDLEDIEQRVPVMDAQYKIIITKTAHLITKESPOEEGKEMPATMSKL  
KEQLTKVKECYSPPLLYESQQLLIPLEELEKQMTSFDQTRLQROIAIDIHFQSMVKKTGDWKH  
VETNSRLMKFENCKKTLTLIEKGSQSQVQFKVTLNSVILKHFQDQTRLQROIAIDIHFQSMVKKTGDWKH  
VETNSRLMKFEESEAKVLRIAQEGLEKGDPEELRRRIEFSQSDLQRVLNAFLKACDELTIDILPEQQQGLQEAVR  
KLHKWQKDLQGEAPYHLLHKIDVEKNRFLASVECRTELDRTKLMPQEGSEKIIKEHRVFFSDKGPHH  
LCEKRLQLIEELCVKLPVRDPVDRTPGTCHVTLKELRAIDSTYRKLMEDPDWKD  
YTSRFSEFSSWISTNETQLKGIGKGEAIDTANHGEVKRABEIRNGVTKRG  
ETLSWLKSRLKVLTEVSSNEAQKOGDELAKLSSSFKALVTL  
LSEVEKMLSNGDCVQYKEIVKNSLEELISGSKEVQEQAEKILD  
TENLFEAQQQLLHHQOKT KRISAKKRDVQQQIAQAOQGEGLPDRGHEELK  
LESTDGLERSRERQERRIQVTLRKWERFETNKETV  
VRYLFQTGSSHERFLSFSSLESLSSELEQTKEFSKRTE  
SIAVQAENLVKEASEIPLGPQNQKQLLQQQAKS  
IKEQVKKLEDTLEEEYVIDKS

Human SYNE1 Protein sequence - var7 (public gi: 2895593) (SEQ ID NO: 301)  
MKQNLQKWWQFNSDLSIWAFLGDTEEELEQLQRLELSTDIDTIELQIKKLKELQKAVDHRKAIILSINL  
CSPEFTQADSKESRDLQDRLSQMNGRWDRCVSLLEWRGLLQDALMQCQGFHEMSHGLLMLENIDRRKN  
EIVPIDSNLDAEILQDHHKQLMQIKHELLESQRLVASLQDMSCQLLVNAEGTDCLEAKEKVHVIGNRLK  
LLKEVSRRHIKELEKLLDVSSSQDLSWSSADELDTSGSVSPTSGRSTPNRQKTPRGKCSLSQPGPSVSS  
PHSRSTKGGSDSSLSEPGPGRSGRGLFRVLRAALPLQLLLLLIGLACLVPMSEEDYSCALSNNFARSS  
TPCSDTRMALLHSELSRCHLQKCW

Human SYNE1 Protein sequence - var8 (public gi: 6330957) (SEQ ID NO: 302)  
LDLCRQSNNLCLQREEDLQRTDRYHDCMNVEVFLEKFTTEWDNLARS  
DAESTAVHLEALKLALALQERKYAIEDLKDKQKMI  
EHLNLDDKELVKEQTS  
HLEQRWFQLED  
LIK  
RKR  
KIQVSVTN  
LEELNV  
VQSRFQELME  
WAEEQOPNIAEALKQS  
PPPDMAQNLL  
MDHLAI  
CS  
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LEAKQML  
LKS  
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AQASLKTYYQNEVTGLWAQGRELMKEVTEQEKEVLGKLQELQSVDLSVQLKCShRLQELEKNLVSRKHF  
EDFDKACHWLQADIVTFPEINLMNESTELHTQLAKYQNILEQSPEYENLLLTQRTGQTILPSLNEVDH  
SYLSEKLNALPRQFMNIVALAKDKFYKVQEAILARKEYASLIELTTQSLSELAQFLRMSKVPTDЛАВЕЕ  
ALSLQDGCRAILDEVAGLGEAVDELNQKKEGFRSTGQPWQPDKMLHLVTLYHRLKROTEORVSLLEDTS  
AYQEHEKMCQQLERQLKSVKEEQSKVNEETLPAEKLKMYHSLAGSLQDSGIVLKRVTHIHLAPLHDP  
LAYEKARHQIQSWQGELKLLTSAIGETVTCECSRVMQSIDFQTEMRSLDWLRRVKAELSGPVYLDLNLQ  
DIQEERIKIQTHQEEVQSSLRIMNALSHKEKEFKTAKELISADEHSLAELSELGDQIEALRTRQATL  
TEIYSOCORYYQVFQAANDWLEDAQEMLQLAGNGLDVESAEEENLKSHMFSTEDQFHNSLEELHSLVAT  
LDPLIKPTGKDLEQKVASLELRSQRMSRDSAQVDLLQRCATAQWHDYQKAREEVIELMDTEKKLSEFS  
LLKTTSSSHEAEKLSHEKALVSVVNSFHEKIVALEEKASQLEKTNQDASRMTTVWQRWTRLRAV  
AQDQEKIILEDADWEWTGFNNKVKKATEMIDQLQDKLPGSSAQEKASKAELLTLSEATLQEQQQSAL  
GMLRQQTLSMLQDGAAPTPGEEPPMQEITAMQDRCLNMQEKVKTNQDASRMTTVWQRWTRLRAV  
VQETKEYLGNPTEIEDAQLEELQILLTEATNHRQNIKEMAEEQEKEYLGLYTIILPSELSLQLAVALDLK  
IRDQIQDKIKEVEQSKATSQELSROIQKLAQDLTTILTQKAKTDNVVQAKTDQKVLGEELDGCNSKLME  
LDAAVQKFLEQNGQLGKPLAKKIGKLTELHOQTIRQAENRLSKLNQAAASHLEEYNEMLELILKIEWAKV  
LAHTGIAWSASQRLREQYILHQVTLGKIIFFK

Human SYNE1 Protein sequence - var9 (public gi: 20521662) (SEQ ID NO: 303  
WISLMENVIQKDEDNIKNSIGYKAIHEYLKQYKGFKIDINCKQLTVDFVNQSVLQISSQDVESKRSDKTD  
FAEQLGAMNKSQWLQGLVTEKIQLEGILLESWEYENNVCQCLKTWFETQEKRKLQQHRIGDQASVQNAL  
KDCQDLEDLIKAKEKEVEKIEQNGLALIQNKEDVVSSIVMSTLRELQWTANLDHMGQLKILLKSVLDQ  
WSSHKVAFDKINSYLMEARYSLSRFRLTGSLLEAVQVQVDNLQNLQDDLEKQERSLQKFGSITNQLLKEC  
HPPVTETLNTLKEVNMRWNLLLEEIAEQLQSSKALLQLWQRKYDYSKQCASTVQQQEDRTNELLKAATN  
KDIADDEVATWIQDCNDLKLGLGTVKDSLFLVHLGEQLKQQVDASAASAIQSDQLLSQHLCALEQALC  
KQQTSLQAGVLDYETFAKSLEALEAWIVEAEEILQGQDPHSSSLSTIQUERMEELKGQMLKFSSMAPDLD  
RLNELGYRLPLNDKEIKRMQNLNRHWSLISQQTTERFSKLQSFLLHQHTFLEKCTWMBFLVQTEQKLAV  
EISGNYQHILLEQQRRAHELFQAEAFMSRQQILHSIIIDGORLLEQGVQDDRDEFNKLTLLSNQWQGVIRRA  
ÓQRRGIIDLQSIROWQRYREMAEKLRKWLVEVSYPMSGLGSVPPIPLQQARTLFDEVQFKEKVFLRQQGSY  
ILTVEAGQKLLSADSGEAALQAEALIQEKKWKSASMRLEEQKKLAFLLKDWEKCEKGIAADSLEKLRT  
FKKKLSQLSPDHHEELHAEQMRCKELENAVGSWTDDLQLSLLKDTLSAYIASADDISILNERVELLQRQW  
EELCHQLSLRRQQIGERLNEAWFSEKNKELCEWLTMQESKVSQNGDILIEEMIEKLKDYQEEIAIAQE  
NKIQLQGMERLAKASHESKASEIEYKLGVNDRWQHILLDLIAARVKKLKTIVAVQQLDKNMSSLRTWL  
AHIESELAKPIVYDSNCSEEIQRKLNEQQELQRDIEKHSTGVASVNLCEVLLHDACATDAECDSIQQ  
ATRNLDRRWRNICAQMSMERRLKIEETWRLWQKFLLDDYSRFEDWLKSSERTAAFPSSSGVITYVAKERLKK  
FEAFQRQVHECLTQLELINKQYRRLARENRTDSACSLKQMVHEGNQRWDNLQKRVTSILRRLKHFFIGQRE  
EFETARDISLVWLTEMQLQTNIEHFSECDVQAKIKQLKAFQQEISLNHNKTEQIIIAQGEQLIIEKSEPLD  
AAIIIEEELDELRRYQCQEVFGRVERYHKKLIRLPLPDDEHLDSDRELEEDSAALSDLHWHDRSADSLLSP  
QPSSNLSQLAQPRLRSERSGRDTPASVDSIPLEWDHDYDLSRDLESAMSRALPSEDEEGODDKDFYLRG  
VALSGDHSALESQIRQLGKALDDSRFQIQQTENIIIRSKTPTGPEDLTSYKGMKLLGECSSSIDSVKRLE  
HKLKEEEESLPGFVNHLHSTETQTAGVILDRWELLQQAQALKELRMQKQNLQKWWQFNSDLNSIWIAWLGDTEE  
ELEQLQRLLELTSDIQTIELQIJKLKLQKAVDHRKAIITLSINLCSEFTQADSKESRDLQDRLSQMNGRW  
DRVCSLLEWRGLLQDALMQCQGFHEMSHGLLLMLENIDRRKNEIVPIDSNLDAEILQDHHKQLMQIKHE  
LLESQRLVAVSLQDMSCQLLVNAEGTDCLEAKEKVHVIGNPLKLLKEVSRHIKELEKLLDVSSSQDLS  
WSSADELDTSGSVSPSGRSTPNRQKTPRGKCSLSQPGPSVSSPHSRSTKGGSQSSLSEPGRSGRGFL  
FRVLRALPLLOLILLIIGLACLVPMSSEDYSCALSNNPARSFHPLRYTNGPPPL

Human SYNE1 Protein sequence - var10 (public gi: 28195689) (SEQ ID NO: 304  
MTEKLQYLTsvyCTEKMSQQVAELGRETEELRQMIKIRLQLNQDAAKDMKKFELKKLQAALEQAQATL  
TSP-EVGRSLSLKEQLSHRQHLLSEMEISLKPKVQAVQLCQSALRIPEDVVASLPLCHAALRLQEEASRLQHT  
A1QOCNIMQEAVVQYEQYEQEMKHQOLIIEGAHREIEDKPVATSNIQELQAOQISRHEELAQKIKGYQEIQI  
ASLNSKCKMLTMKAHKATMLLTVTEVEGLAEGTEDLDGELLPTPSAHPSVVMMTAGRCHTLLSPVTEESG  
EEGTNSEISSLPPACRSPSPVANTDASVNQDIAYYQALSAERLQTDAAKIHPSTSASQEFYEPGLEPSATA  
KLGDLQRSSWETLKNISEKQRTLYEALERQQKYQDSLSQSISTKMEAIELKLSESPEPGRSPESQMAEHQA  
LMDEILMLQDEINELQSSLAEELVSESCADPAEQLALQSTLTVLAERMSTIRMKASGKRQLLEEKLNDQ  
LEEQRQEALQRYRCEADELDSWLSTKATLDTALSPKEPMDMEAQLMDQCQNMVLVEIEQKVVALSELSV  
HNENLLLEGKAHTKDEAEQLAGKLRRLKGSLLLELORALHDQQLNMQGTAQEKEESDVTLTATQSPGVQEW  
LAQARTWTQQRQSSLQQQKELEOEELAEQKSLLRSVASRGEELIQLQHSSAETSGDAGEKPDVLQSQELGME  
GEKSSAEDQMWRMKWEWSLHQEFSTKQKLLQNVLEQEQQEVLYSRPNRLSGVPLYKGDVPTQDKSAVTSSL  
DGLNQAFEEVSSQSGGAKRQSIHLEQKLYDGVSASTWLLDDVEERLFTVADPEETETCLFNQEIILAKD  
IKEMSEEMDKNKNLFSQAFPENGDNRDVIEDTLGCLLGRLLSDSVNQRCHQMKERLQQIILNFQNDLKVK  
LFTSLADNKYIILOKLANVFEPQVVAEQIEAIQQAEDGLKEFDAGIELKRRGDELQVEQPSMQLSKLQD  
MYDELMMIIGSRRSGLNQNLTLSOYERALQDLLETQOEKMGDOKIIVSSKEEIQQPLDKHKEYFQ

GLESHMILTVLFRKIISFAVQKETQFTELMAQASAVLKRAHKRGVELEYILETWSHLDDEQQEQLSRQL  
 EVVESSI P S V G L V E E N E D R L I D R I T L Y Q H L K S S L N E Y Q P K L Y Q V L D D G K R L L I S I S C S D L E S Q L N Q L G E C  
 WLSNTNKMKSKEIHLRLETILKHWTTRYQSESADLIHWLQSAKDRLEFWTQQSVTPQELMVRDHLNAFLF  
 SKEVDAQSSLKSSVLSTGNQLRLKKVDTATLRSELSRIDSQWTDLTNIPAVQEKLHQLOMDKLPSRHA  
 ISEVMWSWTSIMENAIQKDEDNIKNSIGYKAIHEYILQKYKGFKIDINCKQLTVDFVNQSVLQISSQDVSK  
 RSDKTDFAEQLGAMNKSWQILQGLVTEKIQIQLLEGILLESWSEYEENNQCLKTWFETQEKRKLQQHRRIGDQA  
 SVQNALKCQDLEDLKAKDKEVEKEIEQNGLALIQTKKEDVSIVMSTLRELGQTWANLDHMVGQLKILL  
 KSVIDQWSSHKVAFDKINSYLMEARYSLSRFRLTGSLEAVQVQVDNLQNLQDDLEKQERSLQKFGSITNL  
 QLLKECHPPVTETLTNTLKEVNMRWNNLLEEIAEQLQSSKALLQLWQRYKDYSKQCASTVQQQEDRTNEL  
 LKAATNKKDIADDEVATWIQDCNDLLKGJGTVDLSFLVHLGEQKLQQVDAASAASIQSDFQLSLSOHLCA  
 LEQALCKQQTSILQAGVLDYETFAKSLEAVEAEEILQGQDPSSHSDLSTIQRMEELKGQMLKFSS  
 MAPDLDRLNELGYRLPLNDEKIKRMQNLNRHWSLISQTTERFSKLQSFLLQHQTFLKCTWMFELVQT  
 EOKLAVISGNYQHLLERQRAHELPQAEFMSRQQLHSIIIDGQRLLEQGVQDDRDEFNLKLTLLSNQWQ  
 GVIERRAQRRGIIDSQIRQWORYREMAEKLRKWLVESYLPMSGLGSVPILPQQARTLFDEVQFKEKVFL  
 RQOGSYIILTVEAGKQLLSSADSGAEALQAEIAEIQEKWKSASMRLEEEQKKKLAFLLKWDWEKCEKGIA  
 LEKLRTFKKKLQSQSLPDHHHEELHAEQMRCKELENAVGWTDDLTQLSLLKDTLSAYISADDISILNERVE  
 LLQRQWEELCHQQLSRLRQQIGERLNEWAVFSEKNELCEWLTMQESKVSQNGDILIEEMIEKLKDYQEE  
 IATAQENKIQQLQQMGERLAKASHESKASEIEYKLGVNDRWQHLLDLIAARVKKLKETLVAVQQLDKNM  
 SLRTWLAHIESELAKPIVYDSCNSEEIQRKLNEQQELQRDIEKHSTGVASVNLCEVLLHDACATDAE  
 CDSIQQATRNLDERRWRNACAMS MERRLKIEETWRLWQKFLLDDYSRFEDWLKSSERTAAFPSSSGVIYTVA  
 KEELKKFEAFQRQVHECLTQLELINKQYRRLARENRTDSACSLKQMVHEGNQRWDNLQKRVTSILRRKH  
 FIGQREEFETARDSILVWLTQLELINKQYRRLARENRTDSACSLKQMVHEGNQRWDNLQKRVTSILRRKH  
 KSEPLDAIAEEELDELRLRYCQEVFGVERYHKKLIRLPLPDEHDLSRELELESDAALSDDLWHDRSA  
 DSLLSPQPSSNLSLSAQPLRSERSGRDTPASVDSIPLWEHDYDLSRDLESAMSRALPSEDEEGQDDKD  
 FYLRAVALSGDHSALESQIRQLGKALDDSRFQIQQTENIIRSKTPTGPEDTSYKGYMKLLGECSSSID  
 SVKRLHEHKLKEEEEESLPGFVNHLHSTETQTAGVIDRWELLQAAQALSKELRMKQNLQKWWQFNDSL  
 LGDTEEELEQLRLELSTDIOTIELQIKLKELQKAVDHRKAIILSINLCSEFTQADSKESDLQDR  
 QMNGRWDRVCSSLLEWRGLLQDALMQCQGFHEMHSGLLMLENIDRRKNEIVPIDSNLDAEILQDHHKQ  
 MQIKHELLESQLRVASLQDMSCQLLVNAEGTDCLAKEKVHVIGNRLKLLLKEVSRHIKELEKLLDV  
 QDLSWWSSADELDTSGSVSPTSGRSTPNRQKTPRGKCSLSQPGPSVSSPHSRSTKGGSDSSLSEPGPGR  
 SGRGFLFRVLRALPLQLLLLLLIGLACLVPMSSEEDYSCALSNNFARSFHPMLRTNGPPL

Human SYNE1 Protein sequence - var11 (public gi: 28195677) (SEQ ID NO: 305)  
 MVVAEDLSALRMAEDGCVADLPDCNCVDTRARVKKLKETLVAVQQLDKNMSSLRTWLAHIESELAKPIV  
 YDSCNSEEIQRKLNEQQELQRDIEKHSTGVASVNLCEVLLHDACATDAECDSIQQATRNLDERRWRN  
 CAMSMERRLKIEETWRLWQKFLLDDYSRFEDWLKSSERTAAFPSSSGVIYTVAKEELKKFEAFQRQVHECL  
 TQLELINKQYRRLARENRTDSACSLKQMVHEGNQRWDNLQKRVTSILRRKHFIGQREEFETARDSILV  
 LTEMQDLQTNIEHFSECDVQAKIKQLQFQOEIISLNHNKIEQIIAQGEQLEIEKSEPLDAIAEEELDEL  
 RYCYQEVFGVERYHKKLIRLPLPDEHDLSRELELESDAALSDDLWHDRSADSLLSPQPSSNLSLSAQ  
 PLRSERSGRDTPASVDSIPLWEHDYDLSRDLESAMSRALPSEDEEGQDDKDYLRAVALSDVMPESP  
 EAYVKLTENAIKNTSGDHSALESQIRQLGKALDDSRFQIQQTENIIRSKTPTGPEDTSYKGYMKLLGEC  
 SSSIDSVKRLHEHKLKEEEEESLPGFVNHLHSTETQTAGVIDRWELLQAAQALSKELRMKQNLQKWWQFN  
 DSLN SIWA WLGDTEEELQQLRLELSTDIOTIELQIKLKELQKAVDHRKAIILSINLCSEFTQADSKE  
 RDL QDRLSQMNGRWRVCSSLLEWRGLLQDALMQCQGFHEMHSGLLMLENIDRRKNEIVPIDSNLDAE  
 ILQDHHKQLMQIKHELLESQLRVASLQDMSCQLLVNAEGTDCLAKEKVHVIGNRLKLLLKEVSRHI  
 KELEKLL DVSSSQDLSWWSSADELDTSGSVSPTSGRSTPNRQKTPRGKCSLSQPGPSVSSPHSRSTKGG  
 SDSSLSEPGPGR EAVPGRSGRGRFLFRVLRALPLQLLLLLLIGLACLVPMSSEEDYSCALSNNFARS  
 FHPMLRTNGPPL

Human SYNE1 Protein sequence - var12 (public gi: 28192628) (SEQ ID NO: 306)  
 MATSRGASRCPRDIANVMQRLQDEQEIVQKRTFTKWINSHLAKRKPPMVDDLFEDMKDGVKLALLEVL  
 SGQKLPCEQGRMRKRIHAVANIGTALKFLEGRIKIKLVLNINSTDIADGRPSIVLGLMWTTIILYFQIEELTS  
 NLPOLOSLSSASSVDSIVSSETPSPPSKRKVTTKIQGNACKALLKWWQYTAGKQTGIEVKDFGKSWRSG  
 VAFAHSVIAIRPELVLDELTVKGRSNRENLEDAFTIAETELGIPRLLDPEDVDVDPKDEKSIMTYVAQFLK  
 HYPDIHNASTDQEDDEILPLGFPFSFANSVQNFKREDRVIKEMKVWIEQFERDLTRAQMVESNLQDKYQS  
 FKHFRVQYEMKRKQIEHLIQPLHLDGKLSLDQALVKQSWDRVTSRLFDWHIQLDKSLPAPLGTIGAWLYR  
 AEVALREEITVQQVHEETANTIQRKLEQHK

Human SYNE1 Protein sequence - var13 (public gi: 28192522) (SEQ ID NO: 307)  
 HIQLDKSLPAPLGLTIGAWLYRAEVALREEITVQQVHEETANTIQRKLEQHKRKCRMM DLLQNTDAHKRA  
 FHEIYRTRSVNGIPVPPDQLEDMAERFHFSPTSELHLMKMEFLELKYRLLSLLVLAESKLKSWIICKYGR  
 RESVEQLLQNYVSFIENSKFFEQYEVTYQILKQTAEMYVKADGSVEEAENVMKFMNETTAQWRNLS  
 SVEVR SVRSMLEEVISNWDRYGNVTASLQAWLEDAEKMLNQSENAKDFFRNLPHWIQQHTAMNDAGN  
 FLIEDCD

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EMVSRLKQQLLLNGRWELFMEVKQYAQADEMDRMKKEYTDCVVTLSAFATEAHKKLSEPLEVSFMNV  
KLLIQDLEDIEQRVPVMDAQYKIIITKTAHLITKESPQEKGEMFATMSKLKEQLTKVKECYSPLLYESQQ  
LLIPLLELEKQMTSFYDSLGKINEIITVLEREAQSSALFKQKHQ

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Unigene Name: TTC3 Unigene ID: Hs.118174 Clone ID: GD\_1105

Human TTC3 mRNA sequence - var1 (public gi: 2687860) (SEQ ID NO: 202)

ATTAaaaATAACATCTTCTGCCACTTCTGTTCAACATCAAACAGTCCGTAATATCACGATTGCATC  
CCTGTGTGGACGCCAACAAATTCACTGCTTCTGAGATAAATTGAAGAAACTACAACATCTGAGTTGAT  
GGAAGATATTGTGGATTGGCAAAGAAAGTGTGCTATGATTCACTTCCTTATTGGAGGCTTATTGAGAATT  
GGTTGAAAATAGAAAATAAAATCTGGCAATGGAAAGAGCTCTGAATTGGATAAAATATGCAGGGCATG  
TAACAATTCTAACTAATTAGGATCAATTGACAATTGTTGCCCTATGTTAAGTATTCTTACTGAATA  
CAAGTACCCACATAACTAAAATTGTAATGGAAGACTGCAATTGCTGAAGAACTAAAACCAAAGTTGT  
ATGGATTGTATAGAGGAAGGAGAACTATAAGAAAATGAAAGAGTTTCCAAGAAAGATTG  
ATATAGCTATTATCTATTACACAGAGCCATTGAATATGACACTGAAAACACTACCTTATGGTAACCG  
AGCTCTTGTCTTCGTACTGGACAGTTAGAAATGCACTCGGTGATGGAAAGAGAGGCCACTATTCTG  
AAGAACACTTGCCAAAGGGTCATTATCGTTATTGTGATGCTCTTCTATGCTGGGGAAATGACTGGG  
CCCTGCAAGCAAACATAAAAGCTCAAAAACCTCTGAAAAATGACCCTGAGGGAAATCAAGGATCTAATTCA  
GCAGCATGTAAGTTACAAAACAAATAGAAGACCTACAAGGTCGAACAGCAAATAAGGATCCAATTAAA  
GCCTTTATGAAAACAGGGCTACACACCTAGGAGTTATCAGCACCTATATTACTACTTCACCTTAAC  
TTGTGGAGAAGGAAAGAGATTTCAGAAAAATTAAATCAGAAATGGCAACGGTGTAAATCAGAAATCTAAA  
GGTGGGGATGAGGCGTTGAAGGTAGATGATTGACTGTCATCCTGAATTTCACCAACCATCAAGTCAG  
CCTCCAAAACATAAAAGGAAAACAAAAACTCTGAAACAATGAATCAGAAAAGTTCAAGTTCTAGGTCACCCAT  
TGACTTTACCGCAGATTGAGAACATCTGGAGAAAACAGTTCTAAATCTCAAGAGCTGCACACCA  
GGATTTCGCTATAATGAAAATGCTGAGAAAGCTTAATTCCAGATGGCTATATGGCTTATTGGAGCAG  
CGTGGCCGAGCGCTGCACAGGCCCTTACAGGTTGCAACGGTTTAGATCCTCAAAAATAAGCAAT  
TGAACCTGGCCATGATTAACATGTTTGGCTGTATGGACTTGCCATTCTCCTTGGAAATAGGACA  
GCCGTGAGGAATTATCTGAAGCCGAAAACAGTTAAGAGGATTATTGAAACACTACCCCCAGTGAGGGCTT  
GATTGCTGGCTACTGTGGAATTGGAAAAGTATATTGAAAAAAACAGATTCTAGAAGCTCTCAATC  
ACTTTGAGAAAGCAAGAACCTGATTATCGTCTCTGGACTGTTAACTTGGCCCACGAGTAATGTGAT  
TATTGAAGAGTCTCAGCCACAAAAAATAAAAGATGCTGTTAGAGAAATTGTTGAAGAATGCAAGTCCCT  
CCAGTGCAGATGCCATTGTTGCTATCAGAAGTGCCTATGGGATATTCTAAGATCCAGATACTAATG  
ATCCAGACTTTAAGGGTTTATACGCATCAGCTGTTGCCAGTACTGTAAAATAGAATTTCACATGAATTG  
CTGGAAGAAGTAAAAACTACAACCTTTAATGATAAAATTGACAAGGATTCTACAAGGAATATGTCTT  
ACCCCTGACTGTGAGGTGTCATTCTAAAGATTATCATCTTCAGCAGTGGTGTAAAGTTAAATGTGAAT  
TTGAACACAAGGTCTAAAGAAAAGGTTCCCAAGCCTTCTGAAACAGGATTTCTAGCCTAG  
GAAACTAAGACTGAAAGAAGGAAACAAAATTGAAGGAGAAAGATCaaaaAAAAGAAGCaaaaAGTTAGCA  
CAAGAAAGAATGGAGGAGGACTTAAGAGAAAGTAATCCACCCAAAATGAAGAGCAGAAAGAAACTGTAG  
ACAATGTTCAAGCGTTGTCAGTTCTGATGACAGAATTCTACAGTGTATAAGCAGTATGCTGACAAGAT  
TAAATCCGCATACAGAATACAGCCACGCTCTCAAAGAATTGCTTCTGGAAAGTTTGTGAGCACAGAA  
GACTATAACCTGTTCTAGCAGAAATTCTAAATGAAGCAGTGGACTATGTTATTGCCACTTGA  
TTCAAGAAAATAACAGAGTAAAGACAAGAATTCTGCATGTTTGAGTGAGCTTAAAGAAGTGGAGCC  
CAAATTAGCCGCTGGATCCAAAACCTTAATAGCTTGGCTTAGATGCCACAGGAACCTTCTTCCTCGT  
TATGGAGCATCTCTTAAACTGCTTGATTTTAGTATCATGACTTCTCTGGAAATGAGAAATATGGTCACA  
AACTAGACTCTATAGAAGGAAAGCAACTTGATTATTCCTGAGCCAGCATCTGAAGGAGGCCGTTG  
TTAAATATGGCTGCTAGAAGAACACAGAGACAAGTCCCAGCATGCTAGTGTGTTAGATGAATTCTTT  
GATAATAGGACAGCCGCTGACTGTGTTAGGAAACAAGGAGTGGGTGAAAGCACCCTTGTGAAACCA  
AGGTAAAACAAAAGCAAGAAAAGGAAAGCCAAAGGATTCAAGCCTATGTTAGTTGGGTCTGGAAACCA  
TTCAGTAACCTCAAATAATGAGATCATCACTTCAGTGAAGGACCATAGCAATCGAAATTCAAGATTCTGCA  
GCCCAATTGCAAGTGCCTGCCATCTGGCAAGATGTAGAAGAATTGCAAGCTCTATGACCAACACA  
GTAACGAATATGTTGTCGCCATAAGAAGCTATGGGACATGAACCCAAAACAAAATGTTCAACTCTATA  
TGATTACTCTCTCAGTTTGGAGGAACATGGTCCCTGGACATGAGTAACAAGATGTTCTGAGAA  
TATGAGTTTCCCAGAAGAAACTCGACAGATACTAGAAAAAGCAGGAGGTTAAAACCTTTCTTGG  
GATGCCCTCGTTTGTGATTGACAACGTGATTGCACTGAAGAAGGTTGACATCAGGCTCAAGAAAAA  
AAGGAAGAAGAAAACATTAAAACAAAAGTAGAAGAAATTCAAAGCAGGGAGTATGTACGAGTTAAA  
CTACAACTGAATCCAGCTGCTAGGGAAATTAAACCAAGATGTAAGTCTAAACCAGTGTCAAGATTCTT  
CAGCACCAAGCTTTGAAAATGTGAAACCCAAACCTGTGTCGCAAATTCTCCAAGCCAGCTTGTGAAAGA  
TGTGAGGCCAAACCAAGTATCCGACAATTCTCTAGACAAGTTCTGAGGATGGGCAACCCAAAGGGGTC  
TCTCTAAATTCTCTAAACCAAGGCTCTGAGGATGCAAATTACAAGCGAGTCTCTGTAATTCCCCAAAC

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CGGTTCTGAGGATGTGAAACCAACTTATTGGCTCAATCCCATTGGTCACAGGATACTGTACGTATCT  
TCCTTCCAGAGATTGATATCACCCAGACACCGCCAGCATAACATAAACGTGTTACCGAGGTTGCCAG  
TACACCAGCATATACACCCCTGGCCAGCCTTCTCTGAATATCAGCTACCAAGATCAGTACCGAGTGG  
TGCCGCTTTTAGCCAATGACAGAGCAGATAAAATGCTGCTGCCTATTGAGGGTCATCATTGAA  
TGCTGAGAATGTTGCTGGTCACAGATTGCTCTGAACACAGATCCTGAGGGCTTTGGGAATATCT  
GTAAAGTCACACTGCAAGCACAGGTGATGCTCATAACAGTCTGAGTCTAACAGAAATGATGAGCACT  
GTGGAAATTCTAACACAAATGTGAAAGTAATTCCAGAAAGCACCAGTGCAGTAACAAACATTCCACACGT  
GCAGATGGTTGCCATACAGGTATCTTGAACATAATACACCAAGAAGTCATTAACAGGACATATACTCCT  
TTTGGAGAACGACAAGGGAAATTCAAGGATTGAAAGAGCACAAGTATTACAAGACCAACTTCAG  
AAGTGTATGAAAATTATGAGCAGATAAAACTTAAGGGCTTAGAAGAGACAGGGACCTGGAAAGAGAAGTT  
GAAAAGGCACCTTAGAAGAAAACAGATCTAACAGCAGAATTAGATTGGTCTTCAAGATTGGAAAGA  
GAAAATAAAAATGGCAACAGGAAAAAAAGAAATCAGAACAGAAAGACTAAATCACTGAAGAAGAAAATTA  
AAAAGGTTCAAATGCCAGTGAATGTATAACCCAGAAAATGATGAAAGGAAAGGAACATGAATTACA  
TCTGGATCAGTCCTTGAATCAGCAACACACTTACAAATGAGAAAATGAAAATAGAAGAGTATATAAG  
AAAGGAAAGAGGATTATGAAGAGAGTCATCAGAGAGCTGGCTGCAGAGGTATCCGTACTTGAAGAA  
GGAAGGGAGAGTGAAGTGATAAGCTACAGATCATGGAGTCACAAGCAGAACGCCTTCTGAAGAAGCTGG  
GCTGATTAGCCGTGATCCTGCAGCATATCCTGACATGGAGTCATGATACGTACGGAAATTGTTCTT  
TCTAATGTTACAAAGTAATTGAGAAAGCAAAGTCTCAGTTGAAGAACAAATTAGGCAATTAAAATG  
GTTCTGGCTCAGTGAACCTTCTAAAGTGAGATTCTGAGCTTCTGAGCTTCTGAGCTTCTGCTGTAACACGGTCA  
TCCCAGGTTACTCCCTGAGTCCTCAGGCCAGATGGCAAGGGCTTGTGACTCTCTGCAAGCGACGTGACT  
GGAAACACGCCAGCAGCACTTACAGGGATCCTAGTGTCTCTGCTGGTATTCCCCAGGGAGGCTCTT  
CTGGCGCTGGTCCAGGGCACCCCCCTGGTCAGCTGAAGGCAACTCAGCTGACAGGGCCAAACGGGCTGG  
CCAGGCAGCTCTGTCAGAACGAAGGGCTGTGACTGATCGGAAGCAGCCTGTTCTCCAGGACGTGCTGCG  
CGTTCAAGCCAGTCTCCAAAAAAAGCGTTCAATGTTATTAGCAGCTGTCAGTGGTATTCCCAGTGT  
ACAACAGCACTGAGCTGCTGGTTTATTAAAAAAGTGCAGAACAGAAACTCAGTCTCAGGATT  
GAGTATTGATGAAAATTGTCAGAACAGACTTACAGAACACATTCTAGATGAAACAGAAAAGAAAAGCCAAAC  
CCAGGAAAGGACAAGAGGACTTATGAGCCAGCTCTGCCACCCCCGTGACCAGGTCTCCAGGGCTCAC  
CCCTGGTGGTTGTCACCATCCCCAAACCAAGGGCAGAAAGCAGAACAGATGTCCTGTGAGGATTGC  
ACTGGGTGCAAGTTCTGTGAAATATGCCAGGGTGTCAAATAAAAACAGTGCCTGTGCTCAAATGT  
GGGCACAAGTATCAAAGGGTGTAAAGCAGTGGCTTAAAGGCAGAGCGCTTGCCCCGCTGCCAGG  
GTCGTGATCTCCTGACAGAACAGTCACCTCTGGAGGGCTGGCCAGTCAGAACATCAGGAGCTGCCCTC  
CTGCTCTCTAGGTAGTCACACTCAACTAAAGTGTCTGACATCCACCAAGTGTGTTGAATCCGAAGAACATGCAAT  
TTTCTACCAACTGGTGTAAAAAAACAAACATTGTAAGTAATTCCCCACTCTGAGTGAATACTTGTGATTGCCAAC  
TGGAAATCGTTAATATCGTGATATTAAAGTAATTCCCCACTCTGAGTGAATACTTGTGATTGCCAAC  
AGTGGCTAATAAAAATGAGGCTACACACTCATGGTCACTGGGGCTGGCCAGGGCTCTTGTGAGTGGT  
GGCTTCTTTGGAAAGACTATGAAGACGCTCGAAGCAGTATTCTAGTGATAAGAAATTCTAACATAGCCA  
AGCAGCCCCACGTTGTCCTCCACGTTGTTCCCCTTCTGTTGAAAACCTGTTCTGAGCTCCACA  
AGAGAGATGATACTGACTTTAAATTTCAGAACAGTCTGATTCTGATATGCCCTATATTTCTC  
AAAGATTCTGCATTAAAGGATGGGCATAAGAACATATTTAATAATTAGTTAATGTTAAAGTAA  
TTGGCTGATTTAGACCAAAAGATTCAAATCCTCTTGTGAAATCCCCTCTGATTTGATTTTATT  
TTTATGTTCCCCCTGTTAGATTGTTAAGTGTGCTTTCATTTTATAGATGTAATCTGATTTC  
AAAATCTAACACTTTAATTAGTATCGACTAACAGACTTTTCCCCCTGGAAATCGAGGCTGTGTC  
TCATCCCAGCCCCGGTGGAGCTGCTTTGAACTCCGCTCTCTAGCAGCTCTGCTCTC  
TGTGAGTCAGTCAGCGAGTGCTGGATCCGATCCAGCCGTGAGCACACAACAGGCTGTGTTGGA  
AATGGCCACCCACCAATTCTCCTCCCCACCCACCAAAAAAGAGAACGCTGTGCTTTAGACAACCTGAG  
GTATCTGTTACAATCGTCGTGTTGATATTGTTGTAAGTATGCACTGAGCTCTGACTGTGACCT  
AAGAACAAAATGTAACCTGCAATTAGAACCATGAAAATAGATATTGTTGTAAGTCTTGTGACT  
GTAATATAGAACCATGAAATTCTGGTCACTTCCATTCTCCTAACATGAGGATCAAAATGTTT  
CAATGTTCTTGTGTTCACTGGAAACTTAGTGACTCATGAGTTAGCTGATTTGGTCACCTCTG  
CTTGTGTTCACTGTGAGTTGTCATGTCAGTGACTTAGCTAGGCTAACAGCTCACGCCCTAGTTGAAACA  
GATTCTCCACGGTGGTCCCCAAACACTGTCTGCAATCCATAGAACATTGAGCGCTATGGGTGTTAACGT  
GCATGAGGATCAGTTGCACTGGCAGCAAGTACAAAAGGAGAACATCCGTTGAATGAGTGTGTTTG  
TACATAACTTCAGAATCTGTGAACTGCTTATATTGTCACCAACTGTGAGAACATTTCT

Human TTC3 mRNA sequence - var2 (public gi: 1632765) (SEQ ID NO: 203)  
TACATTTGAAAGCTTACTGACATGCAGAAATAGTACAGAAAAACATAAAATAGGAATGTTATTGGCT  
GGGCATGGTGGCTCACACCTGTAATCCCAGCACTTGGGAGGCCAAGGCGGGTGGATCAAAGGTCAAGGA  
GATCGAGACCATCGGCTAACATGGTAAACCCCTGTGCTACTAAAAATTCAAAAATTAGCCAGGTGT  
ACTGGCATGTGCTGTAATCCAGCTACTTGGGAGGCTGAGGCAGGAGAATCACTTGAACCCGGGAGCAA  
GGTTGCAGTGAGCCAAGATCACGCCACTGCACTCCAGCCTGGCGACAGAGCGAGACTCTGTCTCAAAA  
AAACAAAAGAATGCTATGCATAGGTACAATGTCGAAATGTCGAAGAAATACTTCAGAAATATTAAAAGTA  
GTTATTCCCTGGGTAGTTGTGATTGTGACTCTGGGTGACTTTTCCCTTGTTTATTTCCTGTATTTC  
CAAATTCCTATAATGGACATATAATATGGATTTTTTAATAAAATTATCTTTGACTAGATAATA

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TACATGGAAAATTCAACAAAGTACACATATGCAAGATATAACTTTACTATAAAAGAGTGAAAATTTT  
AAATACTTGTTCCTTTAGAAATGCACTCGGTGATGGAAAGAGGCCACTATTCTGAAGAACACTTG  
GCCAAAGGGTCATTATCGTATTGTGATGCTCTTCTATGCTGGGGAAATATGACTGGCCCTGCAAGCA  
AACATAAAAGCTAAAAACTCTGTAAAATGACCCGTAGGGAAATCAAGGATCTAATTCAAGCAGCATGTAA  
AGTTACAAAACAAATAGAAGACCTACAAGGTGCAACAGCAAATAAGGATCCAATTAAAGCCTTTATGA  
AACACGGGCCTACACACCTAGGAGTTATCAGCACCTATAATTACTACTTCACTTAACCTTGTGGAGAAG  
GAAAGAGATTTAGAAGAAATTAATCACGAAATGGCCAACGGTGGTAATCAGAATCTAAAGGTGGCGGATG  
AGGCGTTGAAGGTAGATGATGTGACTGTCATCCGAAATTTCACCACCATCAAGTCAGCCTCCAAAACA  
TAAAGGAAAACAAATCTCGAAACAATGAATCAGAAAAGTTCAGTTCAAGTCTAGTTACCCATTGACTTACCA  
GCAGATTGAGAACATCTGGAGAACAGTTCTAAATCTCCAGAGCTGCACACCCAGGATTGCTA  
ATATAATGAAAATGCTGAGAAGCTTAATTCAAGATGGCTATATGGCCTTATTGGACCGCGTTGCCAG  
CGCTGCACAGGCCCTTACAGAGTGTGCAACGGTTAGATCCTCAAAAATAAGCAATTGAACCTGGCC  
ATGATTAACATATGTTGGTCGTATGGACTTGCCTATTCTCTCCTGGAAATAGGACAGCCTGAGGAAT  
TATCTGAAGCCGAAAACCAGTTAACAGGATTATTGAACACTACCCAGTGGGGCTTGATTGCTTGGC  
CTACTGTGGAATTGAAAAGTGTATTGAAAAAAACAGATTCTAGAAGCTCTCAATCACTTTGAGAAA  
GCAAGAACCTGATTTATCGTCTCCTGGAGTGTAACTTGGCCCACGAGTAATGTGATTATTGAAGAGT  
CTCAGCCACAAAAATAAAAGATGCTTAGAGAAATTGTTGAAGAATGCAAGTCCCTCCAGTGGCAGA  
TGCCATTGTTGCTATCAGAAGTGCCTAGGATAATTCTAAGATCCAGATATACTAACTGATCCAGACTT  
AAGGTTTATACGCATCAGCTGTTGCAGTACTGTTAACAGATTTCACATGAATTGCTGAGAACAGT  
TAAAACACTACAACCTTTAATGATAAAATTGACAAGGATTCTACAGGAAATATGCTTACCCCTGACTG  
TGAAGGTGTCAATTCTAAGATTATCATCTCAGCAGTGGTGGTAAGGTTAAATGTGAATTGAAACACAAG  
GTCATAAAAGAAAAGGTTCTCCAAGACCTATTCTGAAACAGAAATGTTCTAGCCTAGAGAAAACTAAGAC  
TGAAGAACAGACAAAAATTGAGAGAACAGATCCAAAAAAAGAACGAAAAAGTTAGCACAAGAACAGAAT  
GGAGGAGACTTAAGAGAACAGTAATCCACCCAAAAATGAAGAGCAGAAAGAAACTGTAGACAATGTTAG  
CGTTGTCAGTTCTTGATGACAGAAATTCTACAGTGTATAAGCAGTATGCTGACAAGATTAAATCCGGCA  
TACAGAATACAGCCATGCTCTCAAAGAATTGCTTCTGGAAAGTTTGGACACAGAACACTATACAAC  
CTGTTTCTAGCAGAAATTCTAAATGAAGCAGTGGACTATGTTATTGCCACTTGATTCAAGAAAAT  
AACAGAGTAAAGACAAGAATATTCTGCATGTTTGAGTGAGCTTAAAGAAGTGGAGCCAAATTAGCCG  
CCTGGATCCAAAACCTTAATAGCTTGGCTTAGATGCCACAGAACCTTCTCTGTTATGGAGCATC  
TCTTAAACTGCTTGATTTAGTATCATGACTTTCTCTGGAATGAGAAATGGTCACAACAAACTAGACTCT  
ATAGAAGGAAAGCAACTTGATTATTCTCTGAGCCAGCATCTGAAAGGAAAGCCGTGTTAAATATGGC  
TGCTAGAAGAACAGAGAACAGAACAGAGAACAGATGCTTAGTGGAGCTTAAAGAAGTGGAGCCAAATTAGC  
CAGCCGCTGACTGTGTTAAGGAAACAGAGTAGGGTGAAGCAGCTTAAAGAAGTGGAGCCAAATTAGC  
AAAAGCAAGAAAAGCAGAACAGGATTCAAAGCCTATGTTAGTTGGGCTGGAACAACCTCAGTAACCT  
CAAATAATGAGATCATCACTCAAGTGAAGACCATAGCAATCGAAATTCAAGATTCTGCAGGGCCATTG  
AGTGCCTGACCATTCTGGCAAGATGTTAGAAGAACAGCTCTATGACCAACACAGTAACCAATAT  
GTTGCTCCCAATAAGAGCTATGGGACATGAACCCAAAACAAAATGTTCAACTCTATATGATTACTTCT  
CTCAGTTTGGAGGAACATGGCCCTTGACATGAGTAACAAGATGTTCTCTGCAGAATATGAGTTTT  
CCAGAAGAAAACTCGACAGATACTAGAGAAAAGCAGGGAGTTAAAACCTTTCTCTGGGATGCCCTCGT  
TTTGTGTTGACAACTGTTAGCAGTGAAGAACGGTTGCATCAGGCTCAAGAAAAAAAGGAAGAAGA  
AAAACATTAAAACAAAAGTGAAGAACATTCTAAAGCAGGGAGTATGACGAGTTAAACTACAACAG  
TCCAGCTGCTAGGGAAATTAAACAGATGTAACAGCTAAACCCAGTGTGCAATTCTCAGCACCAGCT  
TTTCAAAATGTAACCCAAACCTGTGCTGCAAATTCTCCAAAGCCAGTGTGAAAGATGTGAAGGCC  
AACCAGTATCCGACAATTCTCTAGACAAGTCTCAGGATGGCAACCCAAAGGGGCTCTCTAATT  
TCTTAAACCAAGGCTCTGAGGATGCAAATTACAAGCAGTCTCTGTAAATTCCCCCAAACGGCTTCTGAG  
GATGTGAAACCAACTTATTGGCTCAATCCCATTGGTCAGGATACTGTACGTATCTCCTTCCAGA  
GATTGATATCACCCAGACACCGCCAGCATAACATAACAGTGTACCGAGGTTGCCAGTACACCAGCAT  
ATATACACCTGGCCAGCCTTCTCTGAAATATCAGCTACCAAGATCAGTACAGTGGTGCCGTCTT  
GTAGCCAATGACAGAGCAGATAAAATGCTGCTGCCATTGGAGGTGATCTTGAATGCTGAGAATG  
TTGCTGGTCACAGATTGCCCTGAAACACAGATCCTTGAGGGCTTTGGAAATATGTAAGTCACA  
CTGAGCAGGTGATGCTCATACTGCTGAGTGTAACTGAGAACAGGAAATGAGACTGTGGAAATTCT  
AACAAACAAATGTAAGTAATTCCAGAAAGCAGCAGTGCAGTAACAAACATTCCACACGTGCAAGTGGT  
CCATACAGGTATCTGGAAACATAATACACCAAGAAGTCATAACTGAGCCATATACTTGGGCTCTT  
ACAAGGGAAATTTCACGGATTGAAAAGGAGCAGCAAGTATTACAAGACAACTTCAGAAGTGTATGAA  
AATTATGAGCAGATAAAACCTTAAGGGCTTAGAAGAGAACAGGAGCTGGAAGAGAACGTTGAAAAGGCACT  
TAGAAGAAAACAAAGATCTCAAAGACGAAATTAGATTGGCTCTCAAGATTGGAAAGAGAACATTAAAAA  
ATGGCAACAGGAAAAAAAGAACATCAAGAAAGACTAAATCACTGAAGAACAAAATTAAAGGTTCA  
ATTGCCAGTGAATGTTACCCAGAAAATGATGAAAGAACAGTGAATTACATCTGGATCAGT  
CCCTTGAATCAGCAACACACTTACAAATGAGAAAATGAAAGAGTATATAAGAACGGAAAGA  
GGATTATGAGAGAGTCATCAGAGAGCTGTTGCTGAGGGTATCCGTACTGAAAACCTGGAAGGAGAGT  
GAAGTGTATAAGCTACAGATCATGGAGTCACAAGCAGAACGCCCTCTGAAGAACGCTGGGCTGATTAGCC  
GTGATCCTGCAGCATCTGACATGGAGTCAGTATGGAAATTGTTCTTCTAATGTTAC  
AAAAGAAATTGAGAACAGCAAAGTCTCAGTTGAAGAACAAATTAGGAAATTGGTTCTCGGCTC

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AGTGAACCTTCTAAAGTCAGATTCTGAGCTTCATTCCTGCCTGTAAACACGGTTCATCCCGAGTTAC  
TCCCTGAGTCTCAGGCCACCGATGGCAAGGGCTTGACTCTGCAAGCGACGTGACTGGAAACCACGC  
AGCACTTCACAGGGATCCTAGTGTCTCTGCTGGTGAATTCCCAGGGGAGGCTCCTCTGCGCTGTTG  
CCAGGGCCACCCCTGGTCAGCCTGAAGCCACTCAGCTGACAGGGCCAAAACGGGCTGGCCAGGAGCTC  
TGTCAAGAAGCCCTGTGGTGAAGCAGCCTGTCAGGACGTGCTGGCGTTCAAGCCA  
GTCTCCAAAAAGCCGTTCAATAGTATTATTGAGCACCTGTCAGTGGTATTCCATGTTACAACAGCACT  
GAGCTTGCTGGTTTATTAAAAAGTGCAGAAGCAAAACAAGAACACTCTCAGGATTGAGTATTGATG  
AAATTGTCCAAGAGTACAGAACACATTCTAGATGAACAGAAAAAGAAAAGCCAAACCCAGGAAAGGA  
CAAGAGGACTTATGAGGCCAGCTGCAACCCCCCTGACCAGTCCCTCCCAGGGCTCACCCCTGGTGGTT  
GTTGACCCATCACCCAAAAAGGGGAGGGGAGGAGATGCTGGTGAAGGATTGCACTGGGTGCA  
GTTCTGTGAAATATGCCACGGGTTCAAATCAAAACAGTGCCTGTGCTCAAATGTGGCACAGTA  
TCACAAAGGGTGTAAAGCAGTGGCTAAAGGGCAGAGCCTGCCCCGGCTGCCAGGGTGTGATCTC  
CTGACAGAAGAGTACACCTCTGGAAGAGGCTGGCCAGTCAGAATCAGGAGCTGCCCTCTGCTCTCTA  
GGTAGTCACACTCACTAAAGTGTCAATCCACCAAGTGTGAATCCGAAGAACATGACAATTCTACCACT  
GGTAGTAAAAACAAACATTGAAAGACCTTGTGCAATTGTGTGACAAAGCTAAATACATGGAAATCGTT  
AATATCGCTGATATTAAAGTAATTCCCCACTCTGAGTGAATACATTGATGATTGCCAACAGTGGCTAATA  
AAATGACGGCTACCACACTCATGGGTCACTGGGGCTGCGCAGGGCTTTGAGGTGGCTTCTTTG  
GAAAGTACTATGAACGTCAGCAGTATTCTAGTGAATAAGAATTCTAACATAGCCAAGGCCACG  
TTTGTCCCCACGTTGTCCCCCTTTCTGTTGAAAACCTGTTCTGGTAGCTCCACAAGAGAGATGAT  
ACTGACTTTTAAATTTCAGAAGAGTCTGATTCCTGATATGCCCTATATTTCCTCAAAGATTCTGC  
ATTTTAAGGATGGGCATAAGCAAACATATTTAAATTATAGTTAATGTTAAAATATTGGCTGATTT  
AGACCAAAAGATCAAATCTCTCTTGTGAAATCCCCTGCAATTGCAATTGATTTTATTTATGTTCC  
CCCCTGAGATTGTTAAGTGTGCTTCTCATCTTTAGATGTAATCTGATTTCCTCAAAGATTCTAA  
CACTTTAATTAGTATCGACTAAGACTTTCCCCCTGGAATCGAGGCTGTGTCGTCACTCCAGCC  
CCCGTTGGAGGCTGCTTTGAACTCGCTGCCCTCTAGCAGCTTGTCTCTGTGAGTCAGT  
CAGCAGTGTGCTGGGATCCGCACTCCAGCCGTGCTGAGCACACAACAGGCTGTGTGAAATGGCACCA  
CCATTCTCCTCCCCACCCACCAAAAGAGAACAGCTGTGCTTAGACAACCCCTGAGGTATGTGTT  
ACAATCGTTCTGTGTTGATATTGTGAAAGTATGCATGCAGCTTGTACTGTGACCTAACAGAACAAAC  
TGTAACTGCATTAGAAACCATGAAAAAATTAGATATTGTTGTGACTTTAGACAGTGGTAAATAGA  
ACCATGAATTCTGGTCACATTCCATTCTCTCCAAACATGAAGGATCAAAATGTTCAATGTGTTCT  
TTGTCCACTGGAAACTTAGAGTCATGAGTTATGAGCTGATTGGTCACCTCTCTGCTTTGTTCAC  
TGTGAGTCTGATGTCTTAGTGAATTAGCTTCTAGAACGCTACGCCCTAGTTGAAACAGATTCTCCACG  
GTGGTCCCCAAACACTGTCGATATCCATAAGAATTGAGGCTATGGGTGTTAACGTGCATGAGGATC  
AGTTGCAAGCAGCAAGTACAAAAGGAGAACATCGTGAATGAGTGTGTTGTACATAACTTC  
AGATACTGTGAACATGCCATTATTGTGCAACACTGTCAAGAACATCTAAATGAG

Human TTC3 mRNA sequence - var3 (public gi: 1632763) (SEQ ID NO: 204)

CTGAACTAGTTGCCAGTGTATCTGAAACGTCAGTAACCAAGAGATAAAAGGGTACAATGACAGGAAA  
ATTAGATGTAGTAAAGAGAGTGTGTTGAGAGCAGAAGCTATGCCACTAAAGACTGGATTGAACTCTTC  
CTAGCTGGTGCATGAGCAAATTACTTGATTTAAGTGTGAGCATTTCCTCATCTGTCAGTGGAGATAACG  
ATAATTGTGCCCTGCTAAGAAGAATTGCTGTGAAGAATTAGTAAATGCACTGAAACATTTGGTACAG  
TATGTGACACATAGTACAATAGTTGCTAGGAAGATTGTTATTCTTCACCTGTGATATTGTGAAAGT  
TTTCATACAGCAAATTGGACATCATGAGATGGATTGATTAAATAATAGATTGAACTTCAAGGACTGGT  
AGTGGTCTGCTTGAAAGAAGAAACTTGGTTATCTTAATAATAGTAGGATAATAATGGTGAAGTGT  
AGGTACAAGTAATAGTGTATGATGCGCTGGTGTGATAGGAAAAGAACCTTATATGGCAAGAGC  
TAGAAAGTAATAATGGTGCATTTCAGTGTGATTTGGCCTATGTAGCTATTCTCTGATAACTATAAAA  
ATCCTTATTATTGAAGATTCTCAGGAAAAAAACCCCTAGTGTGAAACTTTAGCACCACCCCTTG  
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TAGCAGTGTGATTGCTATTGCACTAGTGTGAGGCACTTAAAGCAGCAGTCGATAGGAGGATGGAAG  
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GCCCAAGACAGAACACACTGAGATGGGATAGGAGAATATGAGCAGTTGATAGGAAAGTTCTCAGTGGAGT  
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TATTGAGAGCTTACCATGTGCTAGGCACATACAAAGATAAAAGATGCCCTGATGATCCTCTATTAA  
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AGATTAATTATCTGGAGAGAGAGGAAAGTCAGCAGAACATGGGAGGAAATCTTCCGAGCTCAGTGT  
CTGATAGGAGTTATTCCTGGGATAGGTTCAAGTATTCTTAATATACCATAGAACGCCAGGAAAAC  
TTTCTCTGTTATCTCAAATGATTAAATTACTGACATTGAGTTGTGTTCTCCCTAGACTTGTGCACCA  
TGGACAATTGGTGCAGGGAGATTCACTGTGGCCGATTATGCCCTGTTAGAAGATTGCCCTCACGTGGA  
TGATTGTGCTTGTGCTGCAATTATGAGCAATGATTATGTCGTGACTCAGCTTACTGTGATGGG  
GTGGGTGTGCAATATAAGATTATCCAAGTGTGAGGAGATTGAAATTGACATCTGCAGTATATGGT  
GTAGTAAACCAATTCTGCTGCAAGATTGCGATGCCATTAAATAACATCTCTGCCACTTCT  
GTTCAACATCAAACAGTCCGTAATACAGCATTGCACTCCCTGTGGACGCCAACATTACGTGCT

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TCTGAGATAAATTGAAGAAACTACAACATCTTGAGTTGATGGAAGATATTGGGATTGGCAAGAAAAG  
 TTGCTAATGATTCACTTCTTATTGGAGGCTTATTGAGAATTGGTGTAAAATAGAAAATAAAATCTTGGC  
 AATGGAAGAAGCTCTGAATTGGATAAAATATGCAGGCGATGTAACAATTCTAACTAAATTAGGATCAATT  
 GACAATTGGTGGCTATGTTAAGTATTCTTACTGAATGAGGAGAACATAATGAAAATGAAAGGAAAT  
 GAAGAGTTTCCAAGAAGATTTGATATAGCTTATCTTATTACACCAGAGCCATTGAATATAGACCTG  
 AAAACTACCTCTTATGGTAACCGAGCTTTCTTCTCGTACTGGACAGTTAGAAATGCACTCG  
 TGATGGAAAGAGAGGACACTATTCTGAAGAACACTGGCCAAGGGTCATTATCGTTATTGTGATGCTCTT  
 TCTATGCTGGGAAATGATGACTGGGCCCTGAAGCAAACATAAAAGCTCAAAACTCTGAAAAATGACC  
 CTGAGGAATCAAGGATCTAATTAGCAGCATGTAAGTTACAAAACAAATAGAAGACCTACAAGGTCG  
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 CCTATATTACTACTCACTTAACCTTGTGGAGAAGGAAAGAGATTTGAGAAAATTAAATCACGAAATGG  
 CCAACGGTGGTAATCAGAATCTAAAGGTGGCGGTGAGGCGTGTGAAGGTAGATGATTGTACTGTCATCC  
 TGAATTTCACCAACCATCAAGTCAGCCTCAAACATAAAAGGAAACAAAATCTGAAACAATGAATCA  
 GAAAAGTTCAAGTCTAGTTACCAATTGACTTACAGCAGATTGAAGAACATCTTGAGAAAACAGTTT  
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 AACAGATTCTAGAAGGCTCACTTCAACTTGAGAAAAGCAAGAACCTTGATTTATCGTCTCCTGAGTGT  
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 ACTGGTGGTGAAGTTAAATGTGAATTGAAACACAAGGTCAAAAGGTTCCCTCAAGACCTTAC  
 TGAAACAGAAATGTTCTAGCCTAGAGAAACTAAGACTGAAAGAACAAAATTGAAGAGAACAGATCCA  
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 CGAGTCTCTGTAATTCCCCAACCGGTTCTGAGGATGTAACAGCACTTATTGGCTCAATCCCATT  
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 GAGTCTAACAGAAATGATGAGCACTGTGAAATTCTAACACAAATGTAAGTAACTCCAGAAAGCACCA  
 GTGCAAGTACAAACATTCCACACGTGCAAGATGGTGCCTACAGGTATCTGGAAACATAATACACCAAGA  
 AGTCATAACTGAGCCATATAATCCTTTGAGGAACGACAAGGGAAATTTCACGGATTGAAAAGGAGCAC  
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 TTGGTCTTCAAGATTGGAAAGAGAACATTAAAAATGGCAACAGGAAAAAAAGAAATCCAAGAACAGA  
 CTAACACTGAAGAACAAATTAAAAGGTTCAAAATGCCAGTGAACATGATAACCCAGAAAATGATG  
 GAAAGGAAAGGAACATGAATTACATCTGGATCAGTCCCTGAAATCAGAACACACTTACAAATGAGAA

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AATGAAAATAGAAGAGTATATAAGAAAGGGAAAGAGGATTATGAAGAGAGTCATCAGAGAGCTGTGGCT  
 GCAGAGGTATCCGACTTGAAAAGTGGAAAGGAGAGTGAAGTGTATAAGCTACAGATCATGGAGTCACAAG  
 CAGAACCTTCTGAAGAAGCTGGGCTGATTAGCCGTGATCCTGCAGCATATCCTGACATGGAGTC  
 TATACTGTTCATGGAAATTGTTCTTCTAATGTTACAAAAGAAATTGAGAAAGCAAAGTCTCAGTTGAA  
 GAACAAATTAAAGCAATTAAAATGGTCTCGGCTAGTGAACCTTCTAAAGTGCAGATTCTGAGCTTT  
 CATTCTGCCTGTAACACGGTTCATCCGAGTTACTCCCTGAGCTTCAGGCCACGATGGCCAAGGGCT  
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 GGTGATTCCCCAGGGCAGGCTCCCTGCGCTGTCAGGCCACCCCTGGTCAGCTGAAGCCACTC  
 AGCTGACAGGCCAAAACGGCTGGCCAGGCGACTCTGTCAGAACGAAGCCGTGAGCTGATCGGAAGCA  
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 CACCTGTCAGTGTATTCCCAGTCAACACAGCACTGAGCTGCTGGTTTATTAAAAAGTGCAGAAGCA  
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 TTCCCTAGCAGCTCTGCTCTCTGTGAGTCAGCAGCGAGTGTGCTGGGATCCGACATCCAGCCGTGCT  
 GAGCACACAACAGGCTGTGTTGGAAATGCCACCAACCAATTCTCTTCCCACCCACCAAAAGAGA  
 AGCTGTTGCTTTAGACAACCCCTGAGGATCTGTTGAACTCCTGTTGTTGATATTGTTGAAAGTA  
 TGCACTGAGCTCTGACTGTGACCTAAAGAACAAAACGTTGAACTGCACTTAAAGGATGAACTCCATTCTC  
 ATTGTTGACTTTAGACAGTGGTAAATGAAACCATGAAATTCTGGTACATTCCATTCTC  
 ACATGAAGGATCAAAATGTTTCAATGTTCTGTTCACTGTGAGTTCTGATGTTGACTGAGTTAT  
 GAGCTGATTGGTCACCTCTGCTGCTTGTGACTGTGAGTTCTGATGTTGACTGAGTTCTA  
 GAAGCTACGCCCTAGTTGAAACAGATTCTCACCGTGGCTCCAAAACACTGTCTGCATATCCATAAG  
 AATTGAGCGCTATGGGTGTTAACGTGCACTGAGGATCAGTTGCAAGCAGCAAGTACAAAAGGAGAAGAGGA  
 ACATCCGTTGAATGAGTGTGTTGACATAACTCAGATACTTGTGAACATGCCATTATTGTCAC  
 AACTGTCAGAATAAAAGAACACATTCTAAATGAG

Human TTC3 mRNA sequence - var4 (public gi: 1632761) (SEQ ID NO: 205)  
 CTGAACTAGTGTGCCAGTGATCTTGAAACGTGACAGTAACCAAGAGATAAATAGGTGACAATGACAGGAAA  
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 CTAGCTGGTGCACATGAGCAAATTACTTGATTTAAGTGAGCATTTCCCATCTGTCAGTGGAGATAACG  
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 TATGTGACACATAGTACAATAGTTGCTAGGAAGATTGTTATTATTCTCTGTCAGTGGTGTGATATTGTAAGT  
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 AGGTACAAGTAATAGTGTGTTATGATGCCCTGGTGTGATAGGAAAAGAACGCTTATGTCAGTATTCTG  
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 ATCCTTATTATGAAAGATTCTCAGGAAAAAAACCTTAGTCTGAAACTTAC  
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 CAGGATTAGGTAGGCCAGGAGATTGAGAATATAACAGTTGTGTTGAGGCTTGTGTTGAGGCTTGTGTTGAGGCTTGTGTT  
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 TTTCTCTGTTATCTCAAATGATTAACTGACTTGAGTTGTTGTCCTTAGACTTGTGCACCA

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TGGACAATTGTGCTGAGGGAGTTCACTGTGGCGATTATGCCCTGTTAGAAGATTGCCCTACGTGG  
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 ATGATAAAATTGACAAGGATTCTTCTACAAGGAATATGCTTACCCCTGACTGTGAAGGTGTCAATTCTAA  
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 AAGTAATCCACCAAAATGAAGAGCAGAAAGAACACTGTGAGACAATGTTAGCAGCTGTCAGTTCTGAT  
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 CACCGCCAGCATACATAACGTGTTACCAAGGTTGCCAGTACACCAGCATATACACCCCTGGCCAG  
 CCTTCTCTGAAATACAGTACCAAGATCAGTACCAAGTGGTGCCTTTGTAGCCAATGACAGAGCA  
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ACATAATACACCAAGAAGTCAATACTGAGCCATATAATCCTTTGAGGAACGACAAGGGAAATTTCACG  
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 CACTTACAATGAGAAAATGAAAATAGAAGAGTATATAAGAAAAGGAAAGAGGATTATGAAGAGAGTCA  
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 GTGTTGCTTTCATCTTTATAGATGTAATCTGATTCTCAAACACTTAAACACTTTAAATTAGTATC  
 GACTAAGACTTTCCCCCTGGAATCGAGGCTGTGTCCGTCACTCCAGCCCCGGTTGGAGCCTGCTC  
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 ATTCCATTCTCCAACATGAAGGATCAAAAATGTTCAATGTTCTTCTGTTCACTGGAAACTT  
 AGAGTCATGAGTTATGAGCTGATTGGTCACCTCTGCTCTGCTTGTCACTGTGAGTTCTGATGTCTT  
 AGTGAATTAGTCTTGAAGAGCTCACGCCCTAGTTGAAACAGATTCTCCACGGTGGCCCCAAACACTG  
 TCTGCATATCCATAAGAACATTGAGCGCTATGGGTGTTAACGTGATGAGGATCAGTTGCAAGCAGTA  
 CAAAGGAGAAGAGGAACATCCGTTGAATGAGTGTGTTGACATAACTCAGATACTTGTGAAACATGC  
 CTTATATTGTCACAACTGTCAGAATAAAAGAACATTCTAAATGAG

Human TTC3 mRNA sequence - var5 (public gi: 2969902) (SEQ ID NO: 206)  
 ATATAATGTGAGGGTTTTCTCTTTGCGATTAGCAGTGTGATTGAGCTAGTAGTTGTGAGAG  
 CATTAGAACGAGCAGTCGATAGGAGGATGGAAGGTCTGGATGCCCTGGGGAGTTAGGAGATTGGCAG  
 ACTTACCTCTGACCACTCTAGCCCTACTCTTGCCTAACAGACAGAAACACACTGAGATGGATAGGAGAAT  
 GTGAGCAGTTGATAGGAAAGTTCTCAGTGGAGTCAGGATTAGGTAGGCCAGGAGATTGAGAATATAAC  
 AGTTTGTGATGATGAAATGGCATATTCAACAGAACATGCAAGTAAAGCAGTGTAGGGAAACCAAGTGCAG  
 TCAACAGCAAGATGTATTCTGATGCCAGTTCAACATAACATCTTATTGTGAGCAGTCCTACCATGTGC  
 TAGGCAACTATACAAAACAGATAAGATAAGATGCAAGATTGACGATCTCTATGTAAGGACGACATGTA  
 CAATTCACTGCTTAACGAGACTGAGATGAGATTGAGAAACACTACAACATCTGAGTTGATGGAAGATATTG  
 TGGATTGGCAAGGAAAGTTGCTAATGATTCTTATTGGAGGCTATTGAGAATTGGTTGTAAGGAA  
 AGAAAATAAAATCTGGCAATGGAAGAAGCTGAAATTGAGATAAAATGCAAGGCGATGTAACAAATTCTA  
 ACTAAATTAGGATCAATTGACAATTGTTGGCTATGTTAAGTATTCTTACTGAAATAACAGTACCA  
 TAACAAATTGTAATGGAAGACTGCAATTGCTTGAAGAACCTTAAAGTTGATGGATTGTAT  
 AGAGGAAGGAGGACTAATGAAAGAACAGGAAATTGAAAGAGGTTTCCAAGAACAAAGATTGATATAGCTATT  
 ATCTATTACACCAGAGCCATTGAATATAGACCTGAAAACACTACCTTCTTATGGTAACCGAGCTTTGTT  
 TTCCTCGTACTGGACAGTTAGAAATGCACTCGGTGATGGAAAGAGGCCACTATTCTGAAGAACACTTG

GCCAAAGGGTCATTATCGTATTGTGATGCTTTCTATGCTGGGGAAATATGACTGGGCCCTGCAAGCA  
AACATAAAAGCTCAAAACTCTGTAAAATGACCTGAGGGAAATCAAGGATCTAATTCAAGCAGCATGTAA  
AGTTACAAAACAATAGAACCTACAAGGTGCAACAGCAAATAAGGATCCAATTAAAGCCTTTATGA  
AAACAGGGCTACACACCTAGGAGTTATCAGCACCTATTACTACTTCACCTTAACTTGTGGAGAAG  
GAAAGAGATTCAGAAAAATTAAATCAGAAATGCCAACGGTGGTAATCAGAATCTAAAGGTGGCGATG  
AGGCCTGAAAGTAGATGTGACTGTCATCCTGAATTTCACCCACATCAAGTCAGCCTCCAAAACA  
TAAAGGAAAACAAAATCTCGAACAAATGAATCAGAAAAGTTCAGTTCTAGTCACCATGACTTTACCA  
GCAGATTGAAAGAACATCTGGAGAAAAGCTTCTAAATCTCCAGAGCTGCACACCAGGATTTGCTA  
ATATAATGAAAATGCTGAGAGCTTAATCAAGATGGCTATATGCCATTGGAGCAGCGTGGCGAG  
CGCTGCACAGGCCCTTACAGAGTTGCTAACGGTTAGATCCTCAAAAATAAGCAATTGAACCTGGCC  
ATGATTAACATGTTTGGTGTCTATGGACTTGGCATTCTCTCCCTGGAAATAGGACAGCCTGAGGAAT  
TATCTGAAGCCAAAACAGTTAAGAGGATTATTGAACACTACCCAGTGAGGGCCTGATTGCTTGGC  
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Human TTC3 mRNA sequence - var6 (public gi: 1304131) (SEQ ID NO: 207)  
CCTAAAGAAAAGTATTAAAGTAAATAGCAGTACAGATGGCAAATGGATTGCAAAATATCCTCTGGATCC  
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GGTGCCTTGTACAGAGAAGAGGTGCAAAATCAACTTGATGGTAGTGGGAAGATCAGGAAATGCTTC  
CTGAAATTGAGATTAAAGAACTAATAGACATTAGGTGGTGAGAATAAGTTTGTGTTAGGAAGGACAAG  
CAGTTGGTATGACTGGCTCTAGGTTGTGTTAGGAGTGACTGGGATAAAAGCAGGAGCAAGATCA  
CAAAAGGTCTCTATGCTTAAATTAGGAAGTTGGACTTTATCTCAAGCTGAAGGGAAAGCTGTGATG  
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TCAACATCAAACAGTCCGTAAATATCAGAIGCATTGCACTCCCTGTGAGGCCAACATTACGTGTTCT  
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AATTGTTGGCTATGTTAAGTATTCTTACTGAAATACAAGTACCACTAAACTAAATTGTAATGGAG  
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GTATTGAAAAAAACAGATTCTAGAAGCTCTCAATTCTGAGAAGAACAGAAGAACCTGATTATCGT  
CTTCCCTGGAGTGTAACTGGCCACGAGTAATGTGATTATGAGAGCTCAGGCCACAAAAATAAAGA

Figure 36 part - 130

TGCTGTAGAGAAAATTGTGAAGAATGCAAGTCCCTCAGTGCCAGATGCCATTGTTGCTATCAGAA  
TGCCATGGATATTCTAAGATCCAGATATACTAATGATCCAGACTTTAAGGTTTATACGCATCAGC  
TGTTGCCAGTACTGTAAGAATTCACTGAATTGCTGGAAGAAGTTAAAACCTACAACCTTTAATG  
ATAAAATTGACAAGGATTCTACAAGGAATATGCTTACCCCTGACTGTGAAGGTGTCATTCTAAGAT  
TATCATCTCAGCAGTGGTGGTGAAGTAAATGTGAATTGACACAAGGTCAAAGAAAAGGTTCT  
CCAAGACCTATTCTGAAACAGAAATGTTAGCCTAGAGAAACTAAGACTGAAAGAACAAAAATTGA  
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TAATCCACCCAAAAATGAAGAGCAGAAAGAAACTGTAGACAATGTTAGCAGCTTGTCACTTC  
AGAATTCTACAGTGATAAAGCAGTGTGACAAGATTAAATCCGGCATACAGAACAGCCATGCTTC  
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TTCTGCATGTTGAGTGAAGCTTAAAGAAGTGGAGCCAAATTAGCCGCTGGATCAGTCC  
GCTTGGCTTAGATGCCACAGGAACCTTCTCGTTATGGACCATCTTAAACTGCTGATTAG  
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TATTCTCTGAGCCAGCATATTGAAGGAAGGCCCTGTTAATATGGCTGCTAGAACACAGAGACA  
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CTGAAACACAGATCCTTGAGGGCTCTGGGAATATCTGTAAGTCAACTGAGCAGTGGTACAGGATGCTCA  
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ACATGGAGTCGATATACGTTCTGAGGAAATTGTTCTTCTAATGTTACAAAAGAAATTGAGAACAGCAA  
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CTGAAGCCACTCAGCTGACAGGGCAAAACGGGCTGGCCAGGCAGCTCTGTCAGAACGAAGCCCTGTGG  
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TAGTATTATTGAGCACCTGTCAGTGGTATTCCCATGTTACAACAGCACTGAGCTTGTGGTTTATTAAA  
AAAGTGCAGAAGCAAAACAAGAAACTCACTCTCAGGATTGAGTATTGATGAAATTGTCACAGGAGTGA  
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AAGGGGAGAAGCAGAAGATGCCCCGTGAGGATTGCACTGGGTCAGTCCCTGAGAATATGCCAG  
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GGAAGAGGCTGGCCAGTCAAGATCAGGAGCTGGCTTCTGCTCTTCTAGGTAGTCACACTTCACTAAAG  
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AAGACCCATTGTCATTGTTGTCACAAAGCTAAATACATGAAATCGTTAATATCGCTGATATTAGTAA  
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Figure 36 part - 131

GGGGCACTGGCTGCGCAGGGCTTTGAGGTGGCTTCTTTGAAAGTACTATGAACGTCTCGA  
 AGCAGTATTCTAGTGATAAGAATTCTAACATAGCCAAAGCCCCCACGTTGTCACGTTGTTCCC  
 CTTTCTGTTGAAAAACCTGTTCTGGTAGCTCCAAGAGAGATGATACTGACTTTAAATTTCAC  
 AAGAGTCTGTATTCTCTGATATGCCTATATTTCCTCAAAGAGATTCTGCATTAAAGGATGGCATAAGCA  
 AACTATTTAATAATTATAGTTAATGTTAAATATTGGCTGATTAGACCAAAAGATTCAAATCTCC  
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 TTGCTTTCATTTATAGATGTAATCTGATTCTACAAACTTTAATTAGTATCGACT  
 AAGACTTTTCCCCCTGGAATCGAGGCTGTGTCCTGTCAGCTCTGTCAGTCAGCGAGTGCCTGGGATCCGCA  
 AACCTCCGCTGCCCTCCTAGCAGCTCTGTCCTCTGTCAGTCAGCGAGTGCCTGGGATCCGCA  
 TCCAGCCGCTGAGCACACAACAGGCTGTGTCAGGAAATGCCACCACATTCTCCCTCCCCACCCAC  
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 TAGTGAATTAGCTTCTAGAACAGCTACGGCTTAGTTGAAACAGATTCTCACGGTGGTCCCCAAACACT  
 GTCTGCATATCCATAAGAATTGAACGCTATGGTGTAACTGCACTGAGGATCAGTTGAGCAGCAAGT  
 ACAAAAAGAGAAGAGAACATCCGTTGAATGAGTGTGTTGTACATAACTCAGATACTTGTGAACATG  
 CCTTATATTGTCACAACTGTCAGAATAAGAACATTCTAAATGAG

Human TTC3 Protein sequence - var1 (public gi: 2662364) (SEQ ID NO: 308)

IKINIFWPLLQHQNSSVISRLHPDVDANNSRASEINLKKLQHLELMEDIVDLAKKVANDSFLIGGLLRI  
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 MDCIEEGELMKMKGNEEFSKERFDIAIIYYTRAIYEPRPENYLGYNRALCFLRTGQFRNALGDGKRATIL  
 KNTWPKGHYRYCDALSMLEGYDWALQANIKAQKLKNDPEGIKDLIQQHVQLQKQIEDLQGRTANKDPIK  
 AFYENRAYTPRSLSAPIFTSLNFVEKERDFRKINHEMANGGNQNLKVADEALKVDDCDCHPEFSPPSSQ  
 PPKHKGQKSRNNESEKFSSSSPLTPLADLKNIKEQFSKSSRAAHQDFANIMKMLRSLIQDGY  
 RCRSAQAFTELLNGLDPKIKQQLNAMINYLVVYGLAISLLGIGQPEELSEAENQFKRIIEHYPSEG  
 DCLAYCGIGKVLYKKNRFLEALNHFEKARTLIYRLPGVLTWPTSNVIEESQPQKIKMLLEKFV  
 EEECKFPVPAICCYQKCHGYSKIQIYITDPDFKGFI  
 RISCCQYCKIEFHMCWKKLTTTFNMDKIDKDFLQGICL  
 TPDCEGVISKIIIFSSGGEVKCEFEHKVIKEVPPRPILKQKCSSLEKLRKEDKKLKRKIQKKEAKKLA  
 QERMEEDLRESNPPKNEEQKETVDNVQRCQFLDDRLQCIKQYADKIKSGIQNTATL  
 LKELLSWKVLSTE  
 DYTTCFSSRNFLNEAVDYVIRHLIQENNVRVKTRIFLHV  
 LSELKEVEPKLAAWIQKLNSFGLDATGTF  
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 YGASLKLLDFSIMTFLWNEKYGHKLD  
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 PASLKEARCLIWL  
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Human TTC3 Protein sequence - var2 (public gi: 1632766) (SEQ ID NO: 309)

MLGEYDWALQANIKAQKLCKNDPEGIKDLIQQHVQLQKQIEDLQGRTANKDPIKAFYENRAYTPRSLSAP  
 IFTSLNFVEKERDFRKINHEMANGGNQNLKVADEALKVDDCDCHPEFSPPSSQPPKHKKGQKSRNNESE  
 KFSSSSPLTPLADLKNIKEQFSKSSRAAHQDFANIMKMLRSLIQDGY  
 MALLEQRCSAAQAFTELLNGL  
 DPQKIKQQLNAMINYLVVYGLAISLLGIGQPEELSEAENQFKRIIEHYPSEG  
 LDCLAYCGIGKVLYKK  
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Figure 36 part - 132

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EALYDQHSNEYVRNKKLWDMNPQKCKSTLYDYFSQFLEEHGPLDMSNKMFSAEYEFPPEETRQILEKAG  
GLKPFLLGCPRFVVIDNCIALKKVASRLKKRKKNIKTKVEEISKAGEYVRVKLQLNPAAREFKPDVKS  
KPVSDSSSAPAFENVPKPKVSANSPKPACEDVKAKPVDNSSRQVSEDGQPKGVSSNSPKPGSEDANYKR  
VSCNSPKPVLEDVKPTYWAQSHLVTGYCTYLPQRFDITQTTPAYINVLPGLPQYTSIYTPLASLSPEYQ  
LPRSPVVPSPFVANDRADKNAAYFEHHHLNAENVAGHQIASETQILESLGIISVKSHCSTGDAHTVLSE  
SNRNDEHCGNSNNKCEVIPESTSAVTNIIPHQMVAIQWSWIIHQEVTNPPEERQGEISRIEKEHQ  
VLQDQLQEVYENYEQIKLKGLEETRDLEEKLRHLEENKISKTELDWFLQDLEREIKKWQQEKKEIQLERL  
KSLKKKIKKVSNASEMYTQKNDGKEKEHLDQSLEISNTLTNEKMKIEEYIKKGKEDYEESHQRAVAA  
EVSVLENWKESEVYKLQIMESQAEFLKLLGLISRDPAAYPDMESDIRSWELFLSVNTKEIEKAQSOFEE  
QIKAIKNGSRLSELSKVQISELSPFACNTVHPPELLPESSGHGDQGLVTSASDVTGNHAALHRDPSVFSAG  
DSPGEAPSALLPGPPPGQPEATQLTGPKRAGQAALSERSPVADRKOPVPPGRAARSSQSPKKPFNSIIEH  
LSVVFPCYNSTELAGFIKKVRSKNKNSLSGLSIDEIVQRVTEHILDEQKKKKPNPGKDRTYPEPSSATPV  
TRSSQGSPSVVVAAPSPKTGQKAEDVPVRIALGASSCEICHEVFKSKNVRVLKCGHKYHKGCFKQWLKGQ  
SACPACQGRDLTEESPGRGWPSQNQELPSCSSR

Human TTC3 Protein sequence - var3 (public gi: 1632764) (SEQ ID NO: 310)  
MKGNEFSKERFDIAIYYTRAIYR PENYLGYNRALCFRLTGQFRNALGDGKRATILKNTWPKGHY  
RYCDALSMLEGYDWALQANIKAQKLCNDPEGIKDLIQQHVKLQKIEDLQGRANKDPIKAFYENRAYT  
PRSLSAPIFTTSLNFVAKERDFRKINHEMANGGNQNLKVADEALKVDDCCHPEFSPSSQPPKHKGKQK  
SRNNESEKFSSSPLTLPADLKNILEKQFSKSSRAAHQDFANIMKMLRSIQLDGYMALEQRCRCAAQAF  
TELLNGLDPKIKQLNLAMINYLVVYGLAISLLGIGQPEELSEAENQFKRIIBHYPSEG LDCLAYCGIG  
KVYKKNRFLEALNHFEKARTLIYRPGVLTWPTSNVIEESQPKIKMLLEKFVEECKFPPVPAICCY  
QKCHGYSKIQIYITDPDFKGFI RISCCQYCKIEFHMCWKKLTTTFNDKIDKDFLQGICLTPDCEGVIS  
KIIIFSSGGEVKCEFEHKVIKEVKPVRPILQKCSSLEKLRKEDDKLKRKIQKKEAKKLAQERMEEDLR  
ESNPPKNEEQKETVDNVQRCQFLDDRILQCIQYADKIKSGIQNTAMLLKELSWKVLSTEDYTCFSSR  
NFLNEAVDYVIRHLIQENNVRKTRIFLHVLSLKEVEPKLAAWIKLNSFGLDATGTFFSRYGASLKL  
FSIMTFLWNEKYGHKLDSEIGKQLDYFSEPALKEARCLIWLEEHRDKEFPA LHSALDEF DMDMSRCTV  
LRKQDSGEAPFSTKVKNKKKKPKDSKPMVLVSGGTTSVTSNNEITSSEDHSNRNSDSAGPFAVPDHL  
RQDVEEFAELYDQHSNEYVRNKKLWDMNPQKCKSTLYDYFSQFLEEHGPLDMSNKMFSAEYEFPPEETR  
QILEKAGGLKPFLLGCPRFVVIDNCIALKKVASRLKKRKKNIKTKVEEISKAGEYVRVKLQLNPAARE  
FKPDVKS PKVSDSSSAPAFENVPKPKVSANSPKPACEDVKAKPVDNSSRQVSEDGQPKGVSSNSPKPGS  
EDANYKRVSCNSPKPVLEDVKPTYWAQSHLVTGYCTYLPQRFDITQTTPAYINVLPGLPQYTSIYTPLA  
SLSPEYQLPRSPVVPSPFVANDRADKNAAYFEHHHLNAENVAGHQIASETQILESLGIISVKSHCSTGD  
AHTVLSENRNDEHCGNSNNKCEVIPESTSAVTNIIPHQMVAIQWSWIIHQEVTNPPEERQGEIS  
RIEKEHQVLQDQLOEVYENYEQIKLKGLEETRDLEEKLRHLEENKISKTELDWFLQDLEREIKKWQQEK  
KEIQLERLKSLKKKIKKVSNASEMYTQKNDGKEKEHLDQSLEISNTLTNEKMKIEEYIKKGKEDYEES  
HQRAVAAEVSVLENWKESEVYKLQIMESQAEFLKLLGLISRDPAAYPDMESDIRSWELFLSVNTKEIEK  
AKSQFEEQIKAIKNGSRLSEL SKVQISELSPFACNTVHPPELLPESSGHGDQGLVTSASDVTGNHAALHRD  
PSVFSAGDSPGEAPSALLPGPPPGQPEATQLTGPKRAGQAALSERSPVADRKOPVPPGRAARSSQSPKKP  
FNSIIEHLSVVFPCYNSTELAGFIKKVRSKNKNSLGLSIDEIVQRVTEHILDEQKKKKPNPGKDRTYE  
PSSATPVTRSSQGSPSVVVAAPSPKTGQKAEDVPVRIALGASSCEICHEVFKSKNVRVLKCGHKYHKGCF  
KQWLKGQSACPACQGRDLTEESPGRGWPSQNQELPSCSSR

Human TTC3 Protein sequence - var4 (public gi: 1632762) (SEQ ID NO: 311)  
MDNFAEGDFTWADYALLEDCPHVDDCVFAAEFMSNDYVRVTQLYCDGVGVQYKDYIQSERNLEFDICSIW  
CSKPISVLDYCDAIKINIWPPLLFOHQNSSVISRLHPCVDANNRASEEINLKKLQHLELMEDIVDLAKK  
VANDSFLIGGLLRIGCKIENKILAMEALNWIKYAGDVTILT KLSIDNCWPMLSIFFTEYKYHITKIVM  
EDCNLLEELKTQSCMDCIEEGELMKMKGNEFSKERFDIAIYYTRAIYR PENYLGYNRALCFRLTGQ  
FRNALGDGKRATILKNTWPKGHRYRCDALSMLEGYDWALQANIKAQKLCNDPEGIKDLIQQHVKLQKQI  
EDLQGRANKDPIKAFYENRAYTPRSLSAPIFTTSLNFVAKERDFRKINHEMANGGNQNLKVADEALKV  
DCDCHPFSPSSQPPKHKGQKSRNNESEKFSSSPLTLPADLKNILEKQFSKSSRAAHQDFANIMKML  
RSLIQDGYMALEQRCRCAAQAFTELNGLDPKIKQLNLAMINYLVVYGLAISLLGIGQPEELSEAEN  
QFKRIIEHYPSEG LDCLAYCGIGKVYKLNPKLALNHPEKARCLIYRPGVLTWPTSNVIEESQPKI  
KMLLEKFVEECKFPPVPAICCYQKCHGYSKIQIYITDPDFKGFI RISCCQYCKIEFHMCWKKLTTTF  
NDKIDKDFLQGICLTPDCEGVISKIIIFSSGGEVKCEFEHKVIKEVKPVRPILKQKCSSLEKLRKEDKK  
LKRKIQKKEAKKLAQERMEEDLRESNPPKNEEQKETVDNVQRCQFLDDRILQCIQYADKIKSGIQNTAM  
LLKELLSWKVLSTEDYTCFSSRNFLNEAVDYVIRHLIQENNVRKTRIFLHVLSLKEVEPKLAAWIKL  
NSFGLDATGTFFSRYGASLKLDFSIMTFLWNEKYGHKLDSEIGKQLDYFSEPALKEARCLIWLEEHRL  
DKFPALHSALDEF DMDMSRCTVLRKQDSGEAPFSSKTVKNKKKKPKDSKPMVLVSGGTTSVTSNNEII  
TSSEDHSNRNSDSAGPFAVPDHLRQDVEEFAELYDQHSNEYVRNKKLWDMNPQKCKSTLYDYFSQFLEE  
HGPLDMSNKMFSAEYEFPPEETRQILEKAGGLKPFLLGCPRFVVIDNCIALKKVASRLKKRKKNIKTK  
VEEISKAGEYVRVKLQLNPAAREFKPDVKS PKVSDSSSAPAFENVPKPKVSANS PKPACEDVKAKPVDN

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SSRQVSEDGQPKGVSSNSPKPGSEDANYKRVSCNSPKVLEDVKPTYWAQSHLVTGYCTLPFQRFDITQ  
TPPAYINVLGPLQYTSIYTPLASLSPEYQLPRSPVVPFSVANDRAKNAAYFEGHHHLNAENVAGHQI  
ASETQILEGSLGI SVKSHCSTGDAHTVLSSESNRNDEHCGNSNNKCEVIPESTS AVTNIPH VQMVAIQVSW  
NIIHQEVNTEPYNPFEERQGEISRIEKEHQVLQDOLQEVEYENYEQIKLKGLETRDLEEKLKRHLEENKI  
SKTELDWFQDLEREIKKWOQEKKIEQERLKS LKKIKKVSNASEMYTQKNDGKEKEHELHLDQSLEISN  
TLTN EKMKIEEYIKKGKEDYEESHQRAVAEEVS VLNKESEVYKLQIMESQA EFLKKLGLISRDPAAY  
PDMESDIRSWEFLSNTVKTIEKA KSQFEEQIKAIKNGSRLSELSKVQI SELSFPA CNTVHP ELLPESSG  
HDGQGLVTSASDVGNHAALHRDP SFSVAGDSPGEAPSALLPGPPPQPEATQLTGPKRAGQA ALSERSP  
VADRKQPVPPG RAARSSQSPKKP FNSIEHLSVVFP CYNSTELAGFI KKVRSKNKNLSGLS IDEIVQRV  
TEHILDEQKKKKPNPGKDRTYEPSSATPVTRSSQGSPSVVAPSPKTGQKAEDPVRI ALGASSCEIC  
HEVF KSKNVRV LKG HKYHK GCF QWL KGQSAC PAC QGR DLLTEESP SGRG WPSQNQEL PSCSSR

Human TTC3 Protein sequence - var5 (public gi: 2969903) (SEQ ID NO: 312)  
DLKKLQHLELMEDIVDLARKVANDSFTIGGLRTGCKIENKILAMEEALNWIKYAGDVTILT KLG SIDNC  
WPMLSIFFTEKYHITKIVMEDCNLLEELKTQSCMDIEEGGLM KMKGN EFSKERFDIAI IYYTRAIEY  
RPENYLLYGNRALCFCPTGQFRNALGDGKRATILKNTWPKGHRYRC DALSMLGEYDWALQANIKAQKLCK  
NDPEGIKDLIQQHVKLQKQIEDLQGRTANKDPIKAFYENRAYTPRSLSAPIFTTSLFNEKRDFRKINH  
EMANGGNQNLKVADEALKVDDCDCHPEFSPPSSQPPKHKGKQKSRNNESEKFSSSSPLTPADLK NILEK  
QFSKSSRAAHQDFANIMKMLRSLIQDG YMALLEQRCRSAAQAFTELLNGLD P QKIKQLNLAMINYLVVY  
GLAISLLGIGQPEELSEAENQFKRIIEHYPSEG LDCLAYCGIGK VYLKONRFLEALNHFEKARTL IYRLP  
GVL TWP

Unigene Name: UBE2N Unigene ID: Hs.458359

Human UBE2N mRNA sequence - var1 (public gi: 37577134) (SEQ ID NO: 208)  
cccc CGCGCAGTCGCGCGGGTCTGCCGTACCAACC CGTCGCGGGCAGG CTGGCCACGAGCGCAGAGC  
CCCC CGCCCTCCCTCGCGGGCTGTCCAAGTCCCTGCCGCAACAGAGCGTCACTTCCGCCATCCCCGG  
CAGCGGTTGGGGCGGGGCGACGGGGGAGGGGGCAGGT CGGAGGGAGGCCGCGCCGTGCCGAGGCCGC  
GCCCGAGCAGGAGACTACATTCCCGAGGGGCTCGCGCGGCTGCCGAGGCCGAGACGAGACAGAGGCCGAA  
CGGAAGTGGAGCCCGGGACTTCACTCGTGC GTGAGGGAGAGGCCGAGACGAGACAGAGGCCGAA  
CTCGGGTTCTGACAAGATGCCGGCTGCCCGCAGGATCATCAAGGAAACCCAGCGTTGCTGCCAGAAA  
CCAGTTCTGGCATCAAAGCGAACAGATGAGAGCAACGCCGTTATTCTCATGTGGT CATTGCTGGCC  
CTCAGGATTCCCCCTTGGGGAGGGACTTTAACCTGAACTATTCCCTTCCAGAAGAATACCAATGGC  
AGCCCCTAAAGTACGTTCATGACCAAAATTATCATCTTAATGTAGACAAGTTGGGAAGAAATATGTTA  
GATATTTGAAAGATAAGTGGTCCCCAGCACTGCAGATCCGACAGTTCTGCTATCGATCCAGGCC TTGT  
TAAGTGTCCCAATCCAGATGATCCATTAGCAAATGATGTAGCGGAGCAGTGGAAAGACCAACGAAGCCA  
AGCCATAGAAACAGCTAGAGCATGGACTAGGCTATATGCCATGAATAATATTAAATTGATACGATCATC  
AA GTGTGCATCACTTCTCTGTTCTGCCAAGACTCCCTCTTGTGATCTTAATGGACACAGTCTT  
AGAACATTACAGAATAAAAAGGCCAGACATCTCAGTCTTGGTATTAAATGCACATTAGCAAATC  
TATGTCTTGTCTGATTCACTGTCTAAAGCATGAGCAGAGGCCAGAAGTAGATCATCTGATTGTGTGAA  
ACGTTAAAGCAGTGGCCCTCCCTGCTTTTATTCAATTCCCTCCATCTGGTTAAGTATAAAGCAGTG  
TGAATGAAGGTAGTTGTCA GGTTAGCTGCAGGGGTGTGGGTTTTTATT TATTTTATT TATTTTATT  
TTTGAGGGGGAGGTAGTTAAATT TATGGGCTCTTCCCTTTTTGGT GATCTAATTGCTGGTT  
AAAAGCAGCTAAC CAGGTCTTGAAGATATGCTCTAGCCAAGCTAAC TTTAGACGGCTGTAGATGGA  
CAAGCTTGTGATTTGGAAACCAAAATGGGAA CATTAAACAAACATCACAGGCCCTCACTAATAACATTGCTG  
TCAAGTGTAGATTCCCCCTTCAGAAAAGCTTGACCATTTGTATGGCTGTCTGGAAACTCTGTA  
AATCTTATGTTTAGTAAAATTTTGTATTCTACTTTGCTTGTACAGTTATT TACTGTGTT  
ATTCAATTCTCCAATTGACAATGTATT TAAATTGAAACTGATGGAA CATTCTTCTGGTCTTCA  
CCATCTGACAATTGAATGGCAAGAGGTGGATT TGCCAGTTCTTCACTGATGCCAGATT GTGTTAA  
GATAGTACTGAAATGGAGT ATT TATAA ACTGGCCCTGAGCATGCATAAAGCATCAGTATCTGACCTTTT  
TAACCTCTAGGAATTGAAATAAAATGTGTTGTGCTGATTAGATGATCATTGGTGTCTGCCACA  
ATGTTAAAATTACTGTACAGGAAAGTCACAGCAAAGATAGCAGTTGTGACTGACATGTAGGACTTCA  
CAGTTGTGCCACATT TGCCTAAATTGGGTTATGACATT TCTGTTCTTATCTGAAAATT CAT  
CTGTAACCTTCACTGTGTGTTAAGAAACACTGATCTGATCTTGGGATTGCTGAGGCATT GTGAGTC  
TTCCCTTATAAACCTGATGAGCAGATCTCAACTATCTAGCTTGCTGTGTCATCAGAAAGGTTATCCCTT  
AGAGTATCAAGTCTCAGTTAATGATCTGCTTCACTCCCTCAGTATTGCTGTGGAGCTCGTTTA  
TTCTTTAATTGGAAATTCA GTAAATTCTCTTCTTATTGACGAATT CCTCCCTCAGTATTGCTGT  
CCCACCTCTCTCCATATCTAATT CCTGATTCTTATT TAAGTCATAAATGTAGCCAGTCATAAATA  
CATAAAATGTTAACCTCGGTTGCAACCTTGCTCTGCACTGTTAAGGTAATGGATAATTGTAGCCATT  
GAATT TTCTCACTCTTATTCTCGTAATTCTGGAGTTCTCAGATT GTGGTGTATT TATTGCT  
ATGTAAGATGAAGAATTAACTATTAAATTACATTTCACACATAACAAAGCTTTGATGACTGGTAAC TG  
GTATCCTTCCAATTGCTGGTAAAAA AAAAAA AAAAAA

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Human UBE2N protein sequence - var1 (public gi: 4507793) (SEQ ID NO: 313)  
MAGLPRRIKETQRLLAEPVPGIKAEPDESNARYFHVIAGPQDSPFEGGTFKLELFPEEYPMAAPKVR  
FMTKIYHPNVDKLGRICLDILKDWPALQIRTVLLSIQALLSAPNPDDPLANDVAEQWKTNEAQAIETA  
RAWTRLYAMNNI

Human UBE2N pray sequence - var1 (SEQ ID NO: 209)

GCCGCCATGGNGTACCCATACGACGTACCAGATTACGCTCATATGCCATGGAGGCCAGTGAATTCCACC  
CAAGCAGTGGTATCAACGCAAGTGGCGAACACTGGGTTCTGACAAGATGGCCGGCTGCCCGCAGGAT  
CATCAAGGAAACCCAGCGTTGCTGGCAGAACCGAGTCCTGGCATCAAAGCGAACCGAGATGAGAGCAC  
GCCGTTATTTCATGTGGTCAATTGCTGGCCCTCAGGATTCCCCCTTGAGGGAGGGACTTTAAACTTG  
AACTATTCCCTCCAGAAGAATACCCAATGGCAGCCCCCTAAATAAGTGGTCCCCAGCACTGCAGATCCGC  
ACAGTTCTGCTATCGATCCAGGCTTGTAAAGTGTCTCCAACTCAGATGATCCATTAGCAAATGATGTAG  
CGGAGCAGTGGAAAGACCAACGAAGGCCAACGCTAGAAAACAGCTAGAGCATGGACTAGGCTATATGCCAT  
GAATAATATTTAAATTGATACGATCATCAAGTGTGCACTACTCTCTGTCCTGCCAGACTTCCCTC  
TTTGTGTCATTAAATGGACACAGCTTAGAAACATTACAGAATAAAAANCCCAGACATCTTCAGTCCT  
TNGGTGAATTAAATGCACATTAACNTNTGCTGNCTGNCNTAANCNTGANCCNAGGCTN  
AAATTINATCTGGATNNNTNGGAAACNTNAAAACNNGGCCCCNCCNGCTTNTTNATTNCCCCANCCGG  
NTNAANTTAAACCCNGGAATNANGNNNTTNCNGNNACNNNGGGGT

Human UBE2N pray sequence - var2 (SEQ ID NO: 210)

CGAGCGCCGCCCTGGNNNTACCCATACGACGTACCAGNATTACGCTCATATGCCATGGAGGCCAGTGAAT  
TCCACCCAAGCAGTGGTATCAACGCAAGTGGCATTATGCCCGGGGAGAGGAGCCGGAGACGAGACCA  
GAGGCCGAACTCGGGTTCTGACAAGATGGCCGGGCTGCCCGCAGGATCATCAAGGAAACCCAGCGTTG  
CTGGCAGAACCGATTCTGGCATCAAAGCGAACCGAGATGAGAGAACGCCCCTTATTTCATGTGGTCA  
TTGCTGGCCCTCAGGATTCCCCCTTGAGGGAGGGACTTTAAACTTGAACTATTCCCTCAGAAGAATA  
CCCAATGGCAGCCCTAAAGTACGTTCATGACAAAATTATCATCTAAATGTAGACAAGTGGAGA  
ATATGTTAGATATTTGAAAGATAAGTGGTCCCCAGCACTGCAGATCCACAGTCTGCTATCGATCC  
AGGCCTGTTAAGTGTCTCCAAATCCAGATGATCCATTAGCAAATGATGTAGCGGAGCAGTGGAGACCA  
CGAACGCCAACGCAAGAACAGCTAGAGCATGGACTAGGCTATATGCCATGAATAATATTTAAATTGAT  
ACGATCATCAAGTGTGCACTCTCTCTGTCCTGCCAGACTTCNTCTCTTGCTTGCATTTAATGGA  
CACAGTCTTAAAACNTNTGAAATAAAAANCCANACNTTNNTCTGATNAATGCCNTTANCAA  
NNNTNTNTGNCGNCTGNNTAAACCTGNCCNAGNCTNAANTNNNNNGTTTNNNAANNTTAAA  
ANNNTGNCCCCNNNTTTTTNTNCCCCCNGNNTNAANNAANCNTNNANAANGNTTNTNGTNCCNN  
GGNGGGNTTTTTTTTTTTINTN

Unigene Name: UNC84B Unigene ID: Hs.406612

Human UNC84B mRNA sequence - var1 (public gi: 31742497) (SEQ ID NO: 211)  
CCGCCCGCCGCCCTTGTCCCGCGTCGCCGCTCTCGCTGCCCGCGCCCCGGGCCGGCGCTGTGTC  
GCCCTGAGCGGAGCGCCGCCGGGATCCCCACCGCGAAAGGGGGCGCCCGGGCGGCCCTGGCCT  
CGGACGCCCCGGCCGGCTAGAACGCCCGCAGCAGATTCTCTCAGGGGAAGAGTCCACATCCA  
CCTCATCATGTCCTCGAAGAAGCCAGCGCTCACCGCTACTCCCAGGGTACGATGACGGCAGCAGC  
AGCGGGAGGGAGCTGGTGGCTGGAGCTCAGAGCACCCCTGTTAAAGACAGTCCTCTCAGGACCTTGAAGA  
GGAAATCCAGAACATGAAGGCCCTGCCCCAGGCCAACAGCTGGGGCTCTGATGACACACCTC  
CTACTACAGTGTGCTGGCTGGTACGGACTCTGGTGGCTGGAGGAGGGACTCTGGGAGGAAACTGCA  
GACGCCAACATGGGGTGAGGACCTGCCAGGACTCTGGTGGCTGGAGGAGGGACGGGCTGGCTCAGAGAGCAGCAGGG  
CCAGCGGGCTTGTTGGGGCGCAAGGCCACCGAGGACTTCCTGGCTCTCTGGGCTACTCCTCTGAGGA  
CGACTACGTGGGCTACTCGGATGTGGACCAGCAGAGTTCCAGCTCGGGCTCGAAGCGCCGCTCAGGG  
GGGGGCTCTTACTCTGGATGGTGGCCACTCGCAGGCCGGCTCTCAGACTCTCTACTGGTGGGCTG  
GCACCACTGGTACCGCCTGACCAACAGCTGCCCTCCTGACGTCTCGTTAACCAAGGCCCTCTC  
GTCCTGAAAGACGTTCTCTGGTCTGCTGCCGCTGCTCTGCTGACGTGGCTGACGTATGGTCTTGG  
TATTCTACCCCTATGGGCTGCAAGACATTCCACCTGCTTGGTTCTGGTGGGAGCGAAGGACAGCA  
GGAGGCCGGATGGGGCTGGGAAGGCCAGAGACTCATGCCACATTCCAGGCTGAGCAGCGTGTATGTC  
CCGGGTACACTCTGGAGCGCGCTGGAGCTTGTGCTGTAATTTCCTCAAATGGCAGAAGGAG  
GCCATGCGGCTGGAACGCTGGAGCTGCCAGGGCTCTGGCCAGGGAGGTGGTGGCTGAGCC  
ACGAGGACACCCCTGGCGCTGCTGGAGGGCTAGTGTGAGGCCGCCGTGAAGCTGCCCTGAAGGAGGATTCCG  
CAGGAAACTGCTGCTCGCATCCAGGAAGAAACTGCTGCCCTGAGAGCAGAGCATCAGCAAGACTCAGAA  
GACCTCTCAAGAAGATCGTCCGGGCTCCCAAGGAGTCCGAGGCTCGCATCCAGCAGCTGAAGTCAGAGT

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GGCAAAGCATGACCCAGGAGTCCTTCCAGGAGAGCTGTGAAGGAGCTGAGGCCGCTGGAGGACCAGCT  
GGCCGGCTGCAGCAGGAGCTGGCGCTTGCACTGAAGCAGAGCTCGGTGGCGGAAGAAGTGGGCCTG  
CTGCCCCAGCAGATCCAGGCCGTGCGGGACGACGTGGAATCTCAGTTCCGGCTGGATCAGTCAGTCTC  
TTGCCCAGGTGGAGGGGCCGCGTGGGGCTCCTTCAGAGAGAGGAGATGCAAGCTCAGCTGCGAGAGCT  
GGAGAGCAAGATCCTCACCCATGTGGCAGAGATGCAAGGGCAAGTCCGGCAGGGAGCCGGCTCCCTG  
AGCCTGACGCTGCAGAAAGGTGTGATTGGAGTGACAGAGGAGCAGGTGCAACCACATCGTGAAGCAGG  
CCCTGCACTGAGGCCATCGGCTGGCAGACTACGCCCTGGAGTCAGGAGGGCCAGCGT  
CATCAGCACCCGATGTTCTGAGACCTACGAGACCAAGACGCCCTCCAGCCTTCCGGCATCCCCCTG  
TGGTACCACTCCAGTCACCCCCAGTCATCCTCCAGCAGATGTGCAACCAGGCAACTGCTGGGCTTCC  
AGGGGCCACAAGGCTTCGCCGTGGCCCTCTGCCGCATCCGCCACAGCGCTTACCTTAGAGCA  
TGTGCCCAAGGCCCTGTCAACCAACAGCACTATCTCAGTGGCCCAAGGACTTCGCCATCTTGGGTT  
GACGAAGACCTGCAAGCAGGAGGGGAGCCTCTGGCAAGTTCAGTACGATCAGGACGGCAGGCTATTG  
AGACGTTCACTTTCAGGCCCTACGATGCCAGCTAACAGGTGGAGCTGGGAGCTGGGATCTGACTAACTG  
GGGCCACCCCGAGTACACCTGCATCTACGGCTTCAGAGTGCATGGGAGCCGCCCAGTACGCCCTGCTTA  
CTGGTGCCTGCTGCCAGGACATCTGGAGTGGTGAACAGCACCCGCCGCTTCCCCCACAGCCTGCTCG  
GCGCTCTGACTTCTAGAGCACAAGAGAGGAGGCCAGTGGCCCATGAGATGAAAAGGACGGCAGGGC  
TCTTGAGCAGCAGGTGGCTGAGGCCAGGCTCCAGCAGCTCCCTTCCCTCTGTGCC  
GTGGCGTCTGCTTCCATCTGGAGTGTGTATATATGTAGCATATCATGGGGACTGGGAAGTGGGAG  
AGTAGGACCTGACTGGCTGGCTGGGAGGGCTGGGAGCTGGGAGCTGATGAAGCAGGTGCCAGG  
GCTGTGGAGGGCAAGCTACGGCTGGGCTAGGTGAGCTGCCTCTGCCCTGGCAAGGAAGCGAGGCC  
CTCTGGAGGAGGGTGCTTAGCTCCAGAGCAGGATGGACTTCCCAGGCAGGAAGCACTTGATGGAGAG  
CTGCCAGCTCTACAAGGTTAGTGCCTCCACCTAGGAAGCATGAACACAGGGCTCTGAGGGCC  
TTCGACAAAGTGTATTTGCTCCGGGAGGGTAGCAGTGGGCATGGGCTTCTGTGCCCCAAAGGG  
GACTGGCTGTGATCTCTAAGGGGCCAGGGCCAACCTGTAGGCTTCCCTCTGTGCTGGGAGCGTA  
GTTGTTTCTCTCTGATGCTAGGTTGGGCCACCCCTGCTCCCTGTGCTAGGGCTGCCAGT  
GCCCTGAGCTGCTTCCACATTCTCCAGGGTATGGAGACCTAGACCTGCTTGGGCCATTAGCAT  
CTGGGGTATAGCAAGAAGAGTGGGAGCATGGAACCTCTGGCTCTGGGAGCTTCAGGGTATCGG  
-GGTGCAGGTCTGCTGCACCGGCCCCACATCTAACCGGCCCTGATGTAGGGCTGCCGCTCAGGGCT  
GCCCTGGCTCTGCAGCTTGTAGGCTGGCAGGACTACGTTCTGCTGGGAGCTTCTGCTGGGAGCT  
TGGGGCTGGGGAGAGGCTGGCAGAAGTACCTGGGATAGGAAGGGGGAGGAGGGGACTTTAGAGC  
CAGCAGGCCACTGTATTATGTATTTCAAGGTCTGTTTCTAAGCTGCTTCTGCTGGGAGCT  
ATTCCCTAGCCCCGTTCTGTGGGCACTGGGTGATACTCAGTTCTGCTCTGGCCGTTCTGCTGGGGAGCT  
GGGGCACTGGTCCGGCTGTGTGGTGGCTGGCTGGGGAGGGCAAGAAGGCCAGGCTTCA  
CTGCAGCACTGAGCCTCAAATCCGCTCTGGAGCATGAGGCTGGATGAGTGGTGGTGA  
CCATCCGAGGCAGGCCAGGGTTTGTGCTCTGCTGTCACAAATGCTGCACTATTGTTCTTAAGIT  
TTTATCTCCAGATCTAATTATGCTATGCAAAAAAATGACGCCAAGAGCTG

Human UNC84B protein sequence - var1 (public gi: 31742498) (SEQ ID NO: 314)  
MSRRSQRLLTRYSQGDDDGSSSSGGSSVAGSQSTLFKDSLRLTKRKSSNMKRLSPAPQLGPSSDAHTSY  
SESLVHESWFPYPRSSLEELHGDAWGDELVRVRRRGTTGGSESSRASGLVGRKATEDFLGSSSGYSSEDDY  
VGYSVDQQSSSSRLRSAVSRAGSLLWMVATSPGRLFRLLYWAGTTWYRLTTAASLLDVFLTRRFSSL  
KTFLWFLPLLLLTCLYGAWFYFYGLQTFPALVSWAAKDSRSPDEGWEARDSSPHQAEQRVMSRV  
HSLERRLLEALAAEFSSNWQKEAMRLERLELROQAGPQGGGGGLSHEDTLALLEGLVSRRREALKEDFRR  
TAARIQEELSALRAEHQQDSEDLFKKIVRASQESEARIQQLKSEWQSMTQESFQESSVKELRRLEDQILAG  
LQQELAALALKQSSVAEEVGLLPQQIQAVERDDVESQFPWISQFLARGGGGRVGLLQREEMQAQLREILES  
KILTHVAEMQGKSAREAAASLSTLTQKEGVIGVTEEQVHHIVKQALQRYSEDREDIGLADYALESGGASVIS  
TRCSETYETKTALLSLFGIPLWYHSQSPRVIQPDVHPGNCWAQGPQGFAVVRLSARIRPTAVTLEHVP  
KALSPNSTISSAPKDFAIFGFDEDLQQEGTLLGKFTYDQDGEPIQTFHFQAPTMATYQVVELRILTNWGH  
PEYTCIYRFRVHGEPAH

Human UNC84B pray sequence - var1 (SEQ ID NO: 212)  
GATTTGGNAATNCTACAGGGNATGTTAACCACTACAATGGATGATGTATATAACTATCTATTGATG  
ATGAAGATACCCCCACCAAACCCAAAAAAAGAGATCTTAAATACGACTCGACTATAGGGCAGGCCGCCA  
TGGAGTACCCATACGACGTACCAGATTACGCTCATATGGCCATGGAGGCCAGTGAATTCCACCCAAGCAG  
TGGTATCACGCATAGTGGAAAAGCATGACCCAGGAGTCCTTCCAGGAGAGCTCTGTGAAGGAGCTGAGG  
CGGCTGGAGGACCACTGGCCGGCTGCAGCAGGAGCTGGCGGCTCTGGCACTGAAGCAGAGCTCGGTGG  
CGGAAGAAGTGGGCTGTGCCCCAGCAGATCCAGGGCTGCGGGACGACGTGGAATCTAGTTCCCGGC  
CTGGATCAGTCAGTCCCTGCCCCAGGTGGAGGGGGCCGTGGGCTCTTCAGAGAGGAGATGCAA  
GCTCAGCTGCGAGAGCTGGAGAGCAAGATCCTCACCCATGTGGCAGAGATGCAGGGCAAGTCGGCCAGGG  
AAGCCGCGGCCCTCCCTGAGCCTGACGCTNCANAAAGAAGGTGTGATTGGAGTGAAGGAGCAGGTGCA  
CCACATCGTGAAGCAGGCCCTGCAGCGTACAGTGAGGACCGCATCGGGCTGGCAGACTACGCCCTGGAG  
TCAGGAGGGGCCAGCGTACAGCACCCGATGTTCTGAGACCTACNAGACCAAGACGGNNCTNCTCAGCC

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TCTTNGGNATCCCCCTGGGTACCACTCCCAGTCACCCNAGTCATNCTCANATGNGCACCCAGGCNAC  
TGNTGGCCTNCAGGGCANNGGNTNNCCGGGNCCGNTTTCCNA

Human UNC84B pray sequence - var2 (SEQ ID NO: 213)

CGCCGCCATGGTAGTACCCATACGACGTACCACTGGCTCATGGCAGGCCAGTGAATT  
CCACCCAAGCAAGTGGTATCAACGCAAGTGGCATTATGGCTGGGGGACGGCTGAGCCTATTCAAGCT  
TCACATTTCAGGCCCTACGATGGCACGTAACAGTGGAGCTGGGAGCTGAGTACTAAGTGGGCCA  
CCCCAGTACACCTGCATCTACCGCTTCAGAGTGCATGGGAGCCGAACTAGCCCTGCTTACTGGTG  
CCCGCTGCCAGCCATCTGGAGTGGGTAACAGCACCCGCCCTCCCCACAGCTTGCTCGCGCTC  
TGACTTCTAGGAGACAAGAGAGGAGCTGTGGCCCCATGCAGATGAAAAGACGGCAGGGTCTCTGA  
GCANCAAGTGGCTGAGGCCGTAGCANGCTCCANCAGCTCCCTTCCTCCCTGTGCCCCGTGGCG  
TCTGCTTCCATCCTGGAGTGTNTATATNTANCATATCATGGGGACTGG

Unigene Name: VCY2IP1 Unigene ID: Hs.66048 Clone ID: GD\_181

Human VCY2IP1 mRNA sequence - var1 (public gi: 22002952) (SEQ ID NO: 214)

AAGATGGCGGGTGGCTGGATCTGGGCTGCCGGCTCCGAGCTCACTGCTCTCGTGGTGGCAGCG  
AGTTGGGAGCCGGGGCTCTCACCTACGTCTGGAGGAGCTCGAAAGAGGCATCCGTCTGGGATGT  
CGATCCTGGCGTCTGCAACCTGATGAACAGCTCAAGGTCTTGTGTCACACTCTGCCACCTCTCC  
AGCATTGTGAAAGGCCAGGGAGCCTGACCACCGTGGAGACAACTGGAGACCCCTGGTCTCTGAACC  
CATCAGACAAGTCCCTGTATGATGAGCTCGGAACCTTCTGTGGACCCCTGCCCTACAAGTACTGGT  
GTTGGCTGGGCTCTGCCCTGGAGGAGACGGGGAGCTGCTGCTACAGACAGGGGCTCTCGCCTCACCAC  
TTCTCCAGGCTCTGAAAGACAGAGAGATCCGGGACATCTGGCCACACGCCACCTGTGAGCCGC  
CCATACTCACCACATCACCTGGCCACCTTCGGTACAGGGCTAGCCGGCACCCGCTGTGCTGGCTTCA  
GGGGCGCTCCGGCTCCAGCTGCGGCTGAACCCCCCGCGCAGCTGCCAACACTGTGAGGGCTGTGCGAA  
TTCTGGAGTACGTGGCTGAGTCTGGAGCCACCGTCCCCCTCGAGCTGCTGGAGCCCCGACCTCCG  
GGGGCTTCTCAGGCTGGGCGCCCTGCTGTACATCTTCCCTGGAGGGCTGGGGATGCCCTTCTT  
CCCGCTCAATGGCTTCACTGTGCTGGTCAACGGTGGCTCAAACCCCAAGTCCAGTTCTGGAAGCTGGT  
CGGACCTGGACCGCGTGGATGCCGTCTGGTGAACCACCCCTGGCGCCAGCAGCTCCCCGGCTCAACA  
GCCTGCTGCCGGCAAACCTGGCGAGCGCTCCGAGGTGGTGTGGTGGGGCTCTGGGACGACAGGCT  
GCGAGGCTCATCTCCCCAACCTGGGGTCTGCTTCTCAACGCCCTGCCAGGGCCGGCTGGGGCTGGCG  
CGGGCGAGGATGAGGCGGAGCTGGCGTGGAGCTCCGGCGAGCTGGGATCACCCCTCTGCCACTCA  
GCCGCGGCCCGTGCACGCAAACCCACCGTGTCTTCTGAGAAGATGGCGTGGGGCTGGACATGTA  
TGTGCTGACCCCGCCCTCCGCCCGCGAGCGCAGCGTGGCTCTGTGTGCGCCCTGCTGGTGTGGAC  
CCCCGGGCCCCCGGAGAAGGTGGTGCCTGGCGTGTGGCTGGGCTGACCCCGCCCTGCCCTGG  
ACGGCCTGGTCCGCTCGACACTTGAGTTCTCGAGAGAGCCGTGGTACGCCAGGACCTGGAGGG  
GCCGGGGCGAGCCGAGAGCAAAGAGAGCGTGGGCTCCGGGACAGCTCGAAGAGAGAGGGCTCTGGCC  
ACCCACCCCTAGACCTGGCCAGGAGCGCCCTGGGTGGCCGCAAGGAGCCAGCAGGGCTGAGGGCCCAC  
GCAAGACTGAGAAAGAACCCAAGACCCCCCGGGAGTTGAGGAAAGACCCAAACCGAGTGTCTCCGGAC  
CCAGCCGGGGAGGTGCCCGGGCAGCTCTTCTGTGCCAACCTCAAGAACAGCAATGCCAGCGGCA  
CCCAAGCCCCGCAAAGCGCCAGCACGTCCACTCTGGCTTCCCGCCGGCAAATGGACCCCGCAGCC  
CGCCCAGCCTCGATGTGAGAAGCCAGGCCCGGAGCTGCCAGGCCCTCTCCGCCCTCCAGCTGGT  
GGCACGCCAGCCTGGAGCTGGGGCGATCCCAGCGGGGAGGAAGGCAACTGGAGCTGCCCTTGGCC  
GCCAGCTCAATCCCAAGGCCACGCCAACCCCTCCCTGAGTCCCACCGGAGGCCAGGAGCAGC  
GGCTGCTGCTGAGCCACTGCCGGGGGGAGGGCCGGAGACGCCCTCACCCACAGTGACCAACCCAC  
GGTGACCCAGCCCTCAACTCCCGAGAGGTGGCTCCCGCACTCGACCCAGGTGGAGCTGCCCTGTC  
GTGCTTGTGAGCAGGTGCTGCCCTCACCGGAGGTGGCTGAGGCTGGCTGAGGCTCCCGCTGCC  
GCCCGGGGGCGCTGGCTTCCCAACAGTGTGGACTGTGCCCTGGTGTGACCCCTGTGAATTG  
GCATCGCAAGGGCTGCAATGGCACCGCACCTGCTCCCCGGCAGCTGAATGACAGCAGTGGCCGG  
TCACAGGAACGGGCGAGGTGGCTGGGGCTGGGGGGCGAGAGACGCCACCCACATCGGTCAAGGAGTCCCTG  
CCCTGCTGACTCGGATCCCGTGGCCCTGGCCCCGGTGCAGCACTCAGACGAAGACACAGAGGGCTT  
TGGAGTCCCTGCCACGACCCCTTGCTGACCCCTCAAGGTCCCCCACCAGTGCCTGACCCATCCAGC  
ATCTGCATGGTGGACCCCGAGATGCTGCCCTTCAAGAACAGCACGGCAACGGAGAACGTCA  
GGAAGCCCCCTGGCCCGCCCAACTCACCGCAGGCCAGGCCACTCCAGTGGCTGCTGCC  
CAAGGGGCTGCTGGTGGGACCGTGCAGCCAGGCCACTCAGTGGCCAGGAGTGAGCCAGTGAGAAGGG  
GCCGGGGCACCCCTGTCCAGAAAGTCTCAACCCCCAAGACTGCCACTCGAGGCCCCGTGGGGTCA  
GCAGCCGGCCCCGGGTCTAGCCACCCCAAGTCCCCGGTCTACCTGGGACCTGGGCTACCTGCCAG  
CGGGAGCAGGCCCACTGGGATGAGGAGTTCTCCAGCGCTGCCGGCTCTGCTACGTCA  
GGCAGGACCCAGCGCAAGGAGGAAGGGCATGCCGGGGCTGGACCGCTACTGGCAGCAAGCAGCATT  
GGGACCGTACCTGCAAGGTGACCCCTGATCCCCACTTCGACTCGGTGGGCTATGCA  
GACCGACCCCCGGCACAGGGCGTGGCATCACGGTGTGGCAGCAACAGCATGGTCCATGCAGGAG  
GACGCCCTCCGGCTGCAAGGTGGAGTTCTAGCCCCATGCCGACACGCCCCACTCAGCCCAGCCG

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CCTGTCCTAGATTCCAGCACATCAGAAATAACTGTGACTAC

Human VCY2IP1 mRNA sequence - var2 (public gi: 21739762) (SEQ ID NO: 215)  
CCGAAGATGGCGCGGTGGATCTGGGCTGCCCGGCTCGAGCTCACTGCTCTCGTGGTGGCA  
GCGAGTTGGGAGCCCGGGCTCCTCACCTACGTCTGGAGGAGCTCGAAAGAGGCATCCGGTCTGGGA  
TGTGATCCTGGCTCTGCAACCTTGATGAAACAGCTCAAGGTCTTGCTCCGACACTCGCCACCTTC  
TCCAGCATTGTGAAAGGCCAGCGGAGCTGCACCACCGTGGAGACAACCTGGAGACCCCTGGTCTCCTGA  
ACCCATCAGACAAGTCCCTGTATGAGCTCCGGAACCTCTGTGGACCCCTGCCTCACAAGCTACT  
GGTGGTGGCTGGCCCTGCTGGAGGAGACGGGGAGCTGCTGCTACAGACAGGGGCTTCGCTCAC  
CACTCCCTCAGGCTCTGAAGGACAGAGAGATCCGGACATCTGGGACCCACGCCACCTGTGCA  
CGCCCATACTCACCACCTGCCCCACCTCTGGTACTGGGCTCAGCTGGCACCCGTGTGCTGGCCT  
TCAGGGGGCGCTCCGGCTCAGCTGCGCTGAACCCCCCGGCCAGCTGCCAACTCTGAGGGCTGTG  
GAATTCTGGAGTACGTGGTGTAGTCTTGAGGCCACCGTCCCCCTCGAGCTGCTGGAGGCCCCGACCT  
CCGGGGCTTCTCAGGCTGGCCGGCCCTGCTGCTACATCTCCCTGGAGGCCTGGGGATGCCGCTT  
CTTCGGCGTCAATGGCTCACTGTGCTGGTCAACGGTGGCTCAAACCCAAGTCCAGTTCTGGAAGCTG  
GTGCGGACCTGGACCGCGTGGATGCCGTGCTGGTACCCACCCCTGGCGCGACAGCTCCCTGGCCTCA  
ACAGCCTGCTGCGCGCAAACCTGGCGAGCGCTCCGAGGTGGCTGCTGGGGGCTCTGGGACACAG  
GCTGCGCAGGCTCATCTCCCCAACCTGGGGTCTGTTCTCAAGCCTGCGAGGGCGCTGCCG  
GCGCGGGGAGGATGAGGCGGAGCTGGCGTGAACCTGGCGCAGCTGGGATCAGGCTCTGGC  
TCAGCCGCGCCCGTGCAGCAAACCCACCGTGTCTTCCGAGAAGATGGCGTGGGCGCTGGACAT  
GTATGTGCTGACCCGCCCTCCGGCGCGAGCGCAGCTGGGCTCTGGTGTGGGGCTCTGGGAC  
CACCCCGGGGGGGCGAGAAGGTGGTGTGCGTGTGTTCCCGGGTTCGACCCCGCCCTAACCTCC  
TGGACGGGCTGGTCCGCTGAGCACTTGAGGTTCTGCGAGAGCCGGTGGTGAACGCCCCAGGAC  
GGGGCGGGGGCGAGCCGAGAGCAAAGAGAGCGTGGCTCCCGGACAGCTCGAAGAGAGAGGG  
GCCACCCACCTAGACCTGGCCAGGAGCGCCCTGGGGTGGCCCGAAGGAGCCAGCACGGCTGAG  
CACCGAAGACTGAGAAAGAAGCCAAGACCCCCCGGAGTTGAAGAAAGACCCAAACCGAGTGT  
GACCCAGCCGGGGAGGTGGCCGGGAGCCTCTGTGCCCCAACCTCAAGAAGACGAATGCCAGG  
GCACCCAAGCCCCGCAAAGGCCAACGACGTCCCACCTGGCTCCCGCGGTGGCAAATGGACCC  
GCCCGCCCAGCTCCGATGTGGAGAAGGCCAGGCCCCCGAGTCAGCCTGGGCTCTCCGGCCTCC  
GGTGGCCACGCCAGCCTGGAGCTGGGCGATCCCAGCGGGGGAGGAGAAGGCACTGGAGCT  
GCCGCCAGCTCAATCCCAAGGCCACGCCACACCTCCCGTGAACCTGGGACCCCGAGGGCAGCG  
AGCGCTGCTGCTGAGGCCACTCGGGGGGGGGAGGGCGGGGGAGGGCGGGGGAGGG  
CACCGTGACCAAGCGCCACTAACCGCAGAGGTGGCTCCCGCACTCGACCCAGGCT  
TCGGTGTCTTGAGCAGGTGCTGCCCATCCGGGGGACCCAGTGAAGGTGGCTGAGCCTCC  
GTGGCCCCCGGGCGCGCGCTCGGCTTCCCCACACGATGTGACCTGTGCTGGTGT  
TGAGCATCGCAAGCGGTGCAATGGCACCGGACCTGCGTCCCCCGCAGCTGAATGACAG  
CGGTACAGGAACGGGAGGTGGCTGGGGCGAGGAGACGCCACCCACATCGGT  
CCACCCCTGCTGACTCGGATCCCGTGCCCTGGGCCCCGGTGGCAGACTCAGAC  
CTTGGAGTCCCTGCCACGCCCTTGCCCTGACCCCTCAAGGTCCTGGGACCCATCC  
AGCATCTGCATGGTGGACCCGAGATGCTGCCCCAACAGACGACGGCAAAC  
CCCCGAAGCCCCCTGGCCCGCCCAACTCAGCGCTGCCGCCCAAAGC  
AACCAAGGGGCTTGCTGGGGACCGTGGCAGCCGACCACTCAGT  
GGAGGGGGGGGACCCCTGTCCAGAAAGTCTCAACCCCCAAGACT  
CCAGCAGCCGCCGGGGGTGTCCAGCCACGCCCTAACGGCT  
CAGGGGGAGCAGGCCAACCTGGTGGATGAGGAGTTCT  
AGTGGCCAGGACCGAGCGAAGGAGGAAGGAGCAT  
ATTGGGACCGTGAACCTGCAAGGTGACCCCTGAT  
AGAGACGCACGCCGGCACAGCGCTGGG  
GATGACGCCTTCCCCGGCTGCAAGGTTGAGTCTAG  
CCCCCATGCCGACACGCC  
CCGCTGTCCCTAGATTCCAGCACATCAGAAATAACTGTGACTACACTGGTAAAAAAA  
AA

Human VCY2IP1 mRNA sequence - var3 (public gi: 21104445) (SEQ ID NO: 216)  
CCGAGGTGGCTGCTGGTGGGGCTCTGGGACGACAGGCTGGCAGGCTCATCTCCCCAAC  
CTGGGGT  
CGTGTCTTCAACGCCCTGGAGGCCGCTGCCGCTGGCGCGGGAGGATGAGGCGGAGCTGGCG  
AGCCTCTGGCGCAGCTGGCATCACGCCCTGCCACTCAGCGCGGCCCGTGC  
TGCTCTTGAGAAGATGGCGTGGGCCGGCTGGACATGTATGTGCTGC  
GGCAGCGCTGGCTCTGTGTGCGCCCTGCTGGTGTGGCAGCCCGGCC  
GGCAGCGCTGGCTCTGTGTGCGCCCTGCTGGACGGCGCT  
GTGCTGTTCCCCGGITTGCAACCCCGCCCGCTGCCCTGGACGGCG  
CTGGCGCTGGCGCTGCAGCACTTGAGG  
TCCCTGCGAGAGGCCCGTGGTGA  
GGGCTCCCGGGACAGCTCGAAGAGAGAGGCC  
GGGGTGGGGGGCAAGGAGCCAGCACGG  
AA

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GGGAGTTGAAGAAAGACCCAAACCGAGTGTCTCCGGACCCAGCCGGAGGTGGCAGCCCTC  
TTCTGTGCCAACCTCAAGAAGACGAATGCCAGCGCACCAAGGCCAGCAGCTCCGAAAGGCCAGCAGTC  
CACTCTGGCTTCCGCCGGTGGCAAATGGACCCCGCAGCCAGCAGCTGGTGCCTGGAGCTGGGCGAT  
CCCCCAGTGCAGCCTGCGGCTCTCCGCCCTCCAGCTGGTGCCTGGAGCTGGCAGCAGCTGGAGCTGGGCGAT  
CCCAGCGGGGAGGAGAAGGCACTGGAGCTGCCATTGGCCAGCTCAATCCAAAGGCCACGACACCC  
TCCCTGAGTCCCACCGGAGGCCAGAGGGCAGCGAGGGCAGCTGGCTGAGCCACTGCGGGCGGG  
AGGCCGGGCCAGACGCCCTCACCCACAGTGCACACCCACGGTGCACAGCCACTACCCGAGAGGT  
GGCTCCCGCACTCGACCAGGGTGGAGCTCCCTGCGGTGCTTGGAGCTGGAGCTGCCATCC  
GCCCCCAGTGGAGCTGGCTGAGGCTCCCGCTGCGTGGCCCCGGCGGGCGCTGGCTTCCCAC  
ACGATGTGGACTGTGCGCTGGTGTACCCGTGAATTGAGCATCGCAAGGGGGTCCAATGGCACCGGC  
ACCTGCGTCCCCGGCAGCTGAATGACAGCAGTGCCTGGTACAGGAACGGGAGGTGGCTGGGCC  
GAGGAGACGCCACCCACATCGGTAGCGAGTCCCTGCCACCCCTGCTGACTCGGATCCCCTGCGCC  
CCCCCGGTGCGCAGACTCAGACGAAGACACAGAGGGCTTGGAGTCCCTGCCACGCCCTTGCGCTGA  
CCCCCTCAAGGTCCCCCACCACGCTGACCCATCCAGCATCTGCATGGTGGACCCGAGATGTC  
CCCAAGACAGCACGGAAACGGAGAACGTCAGCCGACCCCGAAGGCCCTGGCCCCGCCAACTCACGCG  
CTGCCGCCCCAAAGCCACTCCAGTGGCTGCTGCCAAAACCAAGGGGCTGGCTGGTGGGGACCGTGCCAG  
CCGACCACTCAGTGGCCAGTGGAGCCAGTGAGAAGGGAGGCCGGCACCCCTGTCAGAAAGTCC  
ACCCCCAAGACTGCCACTCGAGGCCCTGGGGTCAAGCCAGCAGCCGGGGGGGTGTCAGCC  
CCAAGTCCCCGGTCACTGGACCTGGCTACCTGGGCTACCTGGGCTGGGGAGCAGCCGGGG  
GTTCTCCAGCGTGCAGCGCTCTGCTACGTCACTCAGTGGCAGGACAGCGAAGGAGGAGCATG  
CGGCCGCTGGAGCTGGAGCAGTGGCAGGACCTGGGACCTGAGGTGACCTGAGGTGACCC  
CCACTTCGACTCGGTGGCATGCATACGTGGTACGGCAGAGACGACGCCGGCACAGGCGTGG  
CACGGTGTGGCAGCAACAGCATGGTGTCCATGCAGGATGACGCCCTCCGGCTGCAAGGTGGAGTTC  
TAGCCCCATGCCGACACGCCCTCACTCAGCCCAGCCGCTGCTCCCTAGATTGCCACATCAGAAAT  
AAACTGTGACTTCCAAAAAA

Human VCY2IP1 mRNA sequence - var4 (public gi: 14250679) (SEQ ID NO: 217)  
GGCACGAGGCCCTCTCGCCGTCATGGCTTCACTGTGCTGGTCAACGGTGGCTCAAACCCAAAGTC  
CAGTTCTGGAAGCTGGTGCAGGCCCTGGACCGCGTGGATGCCGTGCTGGTGAACCCACCCCTGGGCC  
AGCCTCCCGGCCCTCAACAGCCTGCTGCCGCCAAACTGGGGAGCGCTCCGAGGTGGCTGCTGGGG  
GCTCCTGGGACGACAGGCTGCGCAGGCTCATCTCCCCAACCTGGGGTCTGTGTTCTCAACGCTGCGA  
GGCCGCGTGCAGGCCCTGGCGCGAGGATGAGGCGGAGCTGGCGCTGAGCCTCCGGCAGCTGGG  
ATCACGCCCTGCCACTCAGCGGCCGGGGCTGCCAGCCAACCCACCGCTGCTTGGAGAAGATGGGG  
TGGGCCGGCTGGACATGTATGTGCTGACCCGCCCTGCCGGCGAGAAGGTGGTGGCGCGTGT  
CGCCCTGCTGGTGTGGCACCGCAAGACTGAGAAAGCAAGGCCAGACCCCCGGAGTTGAAGAAAGACCC  
CCGGCCGGCTGGGCTCTGGCAGGCCCTAGACCTGGCCAGGAGCGCCCTGGGGTGGCCGAAGGAGCA  
GACGGGCTGGGCCCCACGCAAGACTGAGAAAGCAAGGCCAGACCCCCGGAGTTGAAGAAAGACCC  
AACCGAGTGTCTCCGGACCCAGCCGGAGGTGCGCCGGCAGCCTTGTGCCAACCTCAAGAA  
GACAATGCCAGGCCACCAAGGCCAGCAGCTCCGATGTGGAGAAGCCAGCCCCCAGTGCAGCCTGCC  
GAAATGGACCCCGCAGCCGCCAGCCTCCGATGTGGAGAAGCCAGCCCCCAGTGCAGCCTGCC  
CTCCGGCCTCCAGCTGGGCCACGCCAGCCCTGGAGCTGGGGCGATCCCAGCCGGGGAGGAGAAGGC  
ACTGGAGCTGCCCTGGCGCCAGCTCAATCCAAAGGCCAGCAGCAGCCCTGGAGTCCCACCGGAGC  
CCCGCAGAGGGCAGCGAGCGGCTGCGCTGAGGCCACTGCCGGGGGGAGGCCAGACGCCCTCAC  
CCACAGTGCACACCCACCGCTGAGGCCACTGCCGGGGGGAGGCCAGACGCCCTGAGTGGACCTG  
GGTGGAGCTGGCTGCGTGGCCCCGGCGCCGGCTGGCTTCCCAACCGATGTGGACCTGCGCTGG  
CTGAGCTCCCGCTGCGTGGCCCCGGCGCCGGCTGGCTTCCCAACCGATGTGGACCTGCGCTGG  
TGTCAACCTGTGAATTGAGCATCGCAAGGCGGTGCAATGGCACCGGACCTGCGTCCCCGGCAGCTC  
GAATGACAGCAGTGGCCGGTACAGGAACGGGAGGTGGCTGGGGCCAGGAGACGCCACCCACATCG  
GTCAAGCGAGTCCCTGCCAACCTGTGACTCGGATCCCGTGCCTGGGGCGTGGCAGACTCAG  
ACGAAGACACAGAGGGCTTGGAGTCCCTGCCACGCCCTTGCCCTGACCCCTCAAGGTCCCCCACC  
ACTGCGTGCACCCATCCAGCATCTGCATGGTGGACCCGAGATGCTGCCCTCAAGACAGCACGCC  
GAGAACGTCAGCCGACCCGGAAAGCCCCGGCCAACTCACGCCCTGCCGCCAAAGGCCACTC  
CAGTGGCTGCTGCCAAAAACCAAGGGGCTTGGTGGGGACCGTGCCAGCCGACCAACTCAGTGGGG  
TGAGCCCAGTGAAGAAGGGAGGCCGGCACCCCTGCTGCCAGAAAGTCCCTCAACCCCAAGACTGCC  
GGCCCGTGGGGTCAGCCAGCAGGCCGGGGGGTGTAGGCCACCCCAAGTCCCAGGGCTACCTGG  
ACCTGGCCCTACCTGCGTACGGGAGCAGGCCACCTGGTGGATGAGGAGTTCTCCAGCGTGC  
GCTCTGCTACCGTCACTGAGGCCAGGAGCAGCGCAAGGAGGAAGGCACTGCCGCTGGACCG  
CTGGCCAGCAAGCAGCATGGGACGGTGCACCTGAGGTGACCCCTGATCCCCACTTCGACTCG  
TGCATACGTGGTACGCAGAGACGACGCCGGCACAGGCCGTGGCATCACGGTGTGGGAGCA  
CATGGTGTCCATGCAGGATGACGCCCTCCGGCTTGCAGGTGGAGTTCTAGCCCCATGCC  
CCCCACTCAGCCCAGCCGCTGCTCCCTAGATTGCCACATCAGAAATAACTGTGACTACACTGAAA

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AAAAAAAAAAAAA

Human VCY2IP1 mRNA sequence - var5 (public gi: 13938254) (SEQ ID NO: 218)  
GACACCGACAGGGACTCGTCCACCTCGTGTCTTGAGCAGGTGCTGCCGCATCCGCCCAACCAAGTG  
AGGCTGGCTGAGCCTCCGCTGCGTGGCCCCGGCGCGCCTCGGCTTCCCACAGATGTGGACCT  
GTGCTGGTGTACCCCTGTAATTGAGCATCGCAAGGCGGTGCCAATGCCACGGCACCTGCGTCCCC  
GGCAGCTCGAATGACAGCAGTGCCTGGTCACAGGAACGGGCAGGTGGGCTGGGGCCAGGAGACGCCAC  
CCACATCGTCAGCGACTCTGGCCACCCCTGTGACTCGGATCCCCTGCGCAGGCCCTTGCGTACCCCTGCG  
AGACTCAGACGAAGACACAGAGGGCTTGGAGTCCTCGCCACGACCCTTGCGTACCCCTGCG  
CCCCCAGGACTGAGGGCTTGGAGTCCTCGCCACGACCCTTGCGTACCCCTGCG  
GGAAACAGGAGAACGTCAAGCGCACCCGAAGGCCCTGGCCGGCAACTCACGCGTGC  
AGCCACTCCAGTGGCTGCTGCCAAAACAAGGGGTTGCTGGGGACCGTGCCAGCGACCACTCAGT  
GCCCGAGGTGAGGCCAGTGAGAAGGGAGGCCGGCACCCCTGTCCAGAAAGTCC  
CCACTCGAGGCCGCTGGGGTCAAGCAGCAGCGGCCGGGGGTGTCAGCCACCC  
CTAACCTGGACCTGGCCTACCTGGCAGCGGGAGCAGCGCCACCTGGTGGATGAGGAGTTCTCAGCG  
GTGCGCGCGCTGCTACGTCACTGGCAGGACAGCGCAAGGAGGAAGGCATGCCGGCGTCTGG  
ACCGCCTACTGCCAGCAAGCAGCATTGGACCGTGACCTGCAAGGTGACCTGATCCC  
GGTGGCCATGCACTGTGGTACGCAAGGAGACGCAAGCGCACCGCGCTGGCAT  
AGCAACAGCAGGGTCCATGCAAGGATGACGCCCTCCGGCTGCAAGGTGGAGTTCTAG  
GACACGCCCAACTCAGCCCAGCCGCTGTCCCTAGATTCA  
ACTTAAAAAAAAAAAAA

Human VCY2IP1 mRNA sequence - var6 (public gi: 14042428) (SEQ ID NO: 219)  
AAGATGGCGGGCTGGATCTGGGCTGCCCGGGCTCCGAGCTACTGCTCTCGTGGTGGGCAGCG  
AGTTCGGGAGCCGGGGCTCTCACCTACGTCTGGAGGAGCTCGAAAGAGGCATCCGGTCTGGGATGT  
CGATCTGGCGTCTGCAACCTGTGATGAAAGCTCAAGGTCTTGTGTCCTGACACTCTGCCACCTCTCC  
AGCATTGTGAAAGGCCAGGGAGCCTGCAACCAACGGTGGAGACACCTGGAGACCC  
CATCAGACAAGTCCCTGTATGATGAGCTCCGGAACCTTCTGTGGACCC  
CTGCTCTCACAGCTACAGACAGGGGGCTTCTGCCCTACACGGTGTGG  
GTTGGCTGGGCTCTGCCCTGGAGGAGACGGGGGAGCTGCTGCTACAGACAGGGGG  
TTCCCTCCAGGTCTGAAAGGACAGAGAGATCCGGGACATCTGCC  
CCATACTCACCATCACCTGCCACCTCGGTACTGGCTCAGCGG  
GGGGCGCTCCGGCTCAGCTGGCTGAACCCCCCGCGCAGCTGCC  
TTCCCTGGAGTACGTGGCTGAGTCTCTGGAGCCACCGTCCCC  
GGGGCTTCCCTCAGGCTGGGGCGCCCTGCTGCTACATCT  
CGCGCTCAATGGCTTCACTGTGCTGGTCAACCGTGGCTCAA  
GGCGACCTGGACCCGGCTGGATGCCCTGGCTGGTGA  
GCCCTGCTGCCGGCGCAAACCTGGCGAGCGCCTGGAGGTGGCT  
GGCGAGGCTCATCTCCCCAACCTGGGGTCTGTTCTCAACGCC  
CGCGCGAGGATGAGGCGAGCTGGCGTGA  
GCCCGGGCCCCGGTGCAGCAAACCCACCGTGC  
TGTGCTGCACCCGCCCTCCGCCCGCAGGCCACGCTGG  
CCCCCGGGCCCCGGCGAGAAGGTGGTGC  
ACGGCTGGTCCGCTGCAGCACTTGAGGTTCT  
GCCGGGGGAGAGCAAAGAGAGCGTGG  
ACCCACCCCTAGACCTGGCAGAGCGCCTGGGG  
GCAAGACTGAGAAAAGCCAAGACCCCCGGAG  
CCAGCGCGGGAGGTGCGCGGGCAGCG  
CCCAAGGCGCAGCAGCACG  
CGCCAGCCTCGATGTGGAGAAGCG  
GGCCACGCCAGCCTGGAGCTGGGGCG  
GCCAGCTCAATCCCAAGGCCACGCC  
GGCTGCGCTGAGCCACTGCG  
GGTGACCACGCCCTCACTACCC  
GTGCTCTTGAGCAGGTGCTGCC  
GCCCGGGCGCGCGCTCG  
GCATCGCAAGGCGGTG  
TCACAGGAACGGCAGGTGG  
CCCTGCTGACTCGG  
TGGAGTCCCT  
ATCTGC  
CGGAAG  
CCAAGGG  
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AGGCCGGGCACCCCTGTCCAGAAAGTCTCAACCCCCAAGACTGCCACTCGAGGCCCCGTGGGGTCAGCC  
AGCAGCCGGCCCGGGGTGTCAAGCCACCCACCCAAGTCCCCGGTCTACCTGGACCTGGCTACCTGCCCA  
GCGGGAGCAGCGCCCACCTGGGGATGAGGAGTTCTTCAGCGCGTGCAGCGCTGTACGTACAG  
TGGCCAGGACCAGCGCAAGGAGGAAGGCATGCGGGCCGTCTGGACGCGCTACTGGCCAGCAAGCAGCAT  
TGGGACCGTGACCTGCAGGTGACCTGTACCCCCACTTTGACTCGGTGGCCATGCATACTGGTACCGAG  
AGACGCACGCCGGCACCGGGCTGGCATCACGGTGTGGCAGCAACAGCATGGTGTCCATGCAGGA  
TGACGCCCTCCGGGCTGCAAGGTGGAGTTCTAGCCCCATGCCGACACGCCCAACTCAGCCCAGCCC  
GCCTGTCCCTAGATTCAAGCCACATCAGAAATAACTGTGACTACACTTG

Human VCY2IP1 mRNA sequence - var7 (public gi: 13623504) (SEQ ID NO: 220)  
GGCACGAGGCCCTGTATGATGAGCTCCGGAACCTTCTGGACCCCTGCCTCTCACAGCTACTGGTGT  
GGCTGGGCCCTGCTGGAGGAGACGGGGAGCTGCTGCTACAGACAGGGGCTTCGCTCACCACCTC  
CTCCAGGTCCCTGAAGGACAGAGAGATCCGGACATCTGGCCACCGCCCCACCTGTGAGCCGCCA  
TACTCACCACCTGCCAACCTCGGTACTGGCTCAGCTGGCACCCGCTGTGCCCTGGCTTCAGGG  
GGCGCTCCGGCTCAGCTGGCTGAACCCCCCGGCGAGCTGCCAACTCTGAGGGCTGTGCGAAATT  
CTGGAGTACGTGGCTGAGTCTCTGGAGCCACCGTCCCCCTCGAGCTGCTGGAGCCCCCACCCTCCGGG  
GCTTCCTCAGGCTGGCCGGCCCTGCTGCTACATCTTCCTGGAGGCTCGGGGATGCCCTTCTTCG  
CGTCAATGGCTTACTGTGCTGTCACGGTGGCTAAACCCCAAGTCTCTGGAGGCTGTGCG  
CACCTGGACCGCGTGGATGCCGTGCTGTGACCCACCTGGCGCGACGCCCTCCCCGGCTCAACAGCC  
TGCTGCGCCGCAAACCTGGCGAGCGCTCCGAGGTTGGCTGCTGCTGGGGGCTCTGGGAGCACAGGCTGCG  
CAGGCTCATCTCCCCAACCTGGGGTCTGTTCTCAACGCCCTGCGAGGCGCGTGCAGGCTGGCGCG  
GGCGAGGATGAGGGAGCTGGCGTGCAGGCTCTGGCGAGCTGGCAGCTGGCATCACGCCCTGCACTCAGCC  
GGGGCCCCGTGCCAGCAAACCCACCGTGTCTTCAGAAGATGGCGTGGGCCGGCTGACATGTATGT  
GCTGCACCCGCCCTCCGCCGGCGCGAGCGCACGCTGCCCTGTGTGCGCCCTGCTGGTGTGGCACCCC  
GCCGGCCCCGGCGAGAAGGTGGCGCGTGTGTTCCCGGTTGACCCCGCCGCTGCCCTGGAGC  
GCCCTGGTCCGCTGCAAGCACTTGAGGTTCTGCGAGAGGCCGTGGTACGCCAGGACCTGGAGGGCC  
GGGGCGAGCGAGAGCAAAGAGAGCGTGGCTCCCGGGACAGCTGAAGAGAGGGCTCCGGCACCC  
CACCCCTAGACCTGGCCAGGAGGCCCTGGGTGGCCCGCAAGGAGCCAGCACGGCTGAGGCCCCAACCGA  
AGACTGAGAAAGAACCAAGACCCCCCGGAGTTGAAGAAAAGACCCAAACCGAGTGTCTCCGGACCC  
GCCGGGGAGGTGGCCGGCGAGCTTCTGTGCCAACCTCAAGAACGCAATGCCAGGCGGACCC  
AAGCCCCGAAAGGCCAGCACGCTCCACTCTGGCTCCCGGGTGGCAATGGACCCCGCACCCCG  
CCAGCCCTCGATGGAGAACCGAGCCCCCGGAGCTGCCCTGCGGCTCTCCGGCTCCAGCTGGTGG  
CACGCCAGCTGGAGCTGGGCCATCCCCAGCGGGGGAGGAGAACGGACTGGAGCTGCCCTTGGCC  
AGCTCAATCCCCAAGGCCAGCACACCCCTCCCTGAGTCCCACGGAGGCCCGAGAGGGAGCGAGCGG  
TGTGCTGAGGCCCACGGGGGGGGGGAGGGGGGCCAGACGCCCTACCCACAGTGACCAACACCCACGGT  
GACCACGGCCACTACCGGAGGGAGCTGGCTCCCGCACTCGACCGAGGTGGAGCTCCCTGTCGGT  
TCTTTGAGCAGGTGCTGCCGCATCGCCCCCACCAGTGAGGCTGGCTGAGCCTCCCGTGCCTGGCC  
CCCCGGCGGGCGCTGGCTTCCCCACAGATGTGGACCTGTGCTGGTGTCAACCTGTGAATTGAGCA  
TCGCAAGGGGGTGCACATGGCACCGCACCTGCGTCCCCCGGAGCTCGAATGACAGCAGTGCCTGG  
CAGGAACGGGAGGTGGCTGGGGCCAGGAGACGCCACCCACATGGTCAGCGAGTCCTGCCACCC  
TGTCTGACTCGGATCCCGTGCCTGGCCCTGGCCCCGGTGCAGACTCAGACGAAGACACAGAGGGCTTGG  
AGTCCCTGCCACGACCCCTTGCTGACCCCTCAAGGTCCCCCACCAGCTGCTGACCCATCCAGCATC  
TGCATGGTGGACCCAGATGCTGCCCTCAAGACAGCACGGAAACGTCAGCGCACCCGG  
AGCCCCCTGGCCCGCCCAACTCACGCGTGCCTGGCCCCAAAGCCTCCAGTGCTGCTGCCAAACCA  
GGGGCTTGCTGGTGGGAGCCGTGCCAGCCACCTCAGTGCCCCGGAGTGAGCCCAAGTGAGAAGGGAGC  
CGGGCACCCCTGTCAGAAAGTCTCAACCCCCAAGACTGCCACTCGAGGGCCCTGGGGTCACTGCCAGCG  
GCCGGCCGGGGTGTGACGCCACCCACCGAGTCCCCTGACTCTGGACCTGGCTACTGCCAGCG  
GAGCAGGGGGACCTGGGTGAGGAGTCTTCCAGGGCTGGCGCTGTGCTACGTACAGTCAGTGG  
CAGGACAGCGCAAGGAGGAAGGGCATGCCGGCTCTGGACCGCTACTGCCAGCAAGCAGCATGG  
ACCGTGAACCTGCAAGGTGACCCGATCCCCACTTGACTCGGTGCCATGCAACAGCAGTGGTACCGAGAGAC  
GCACGCCGGCACCGCGTGGCATCACGGTGTGGCAGCAACAGCATGGTGTCCATGCAAGGATGAC  
GCCCTCCGGCTGCAAGGTGGAGTTCTAGCCCCCATGCCAGCACGCCACCCACTCAGGCCAGCCCC  
GTCCCCTAGATTCAAGGCCACATCAGAAAATAAAACTGTGACTACACTTGAAAAAAAGAAAAAA

Human VCY2IP1 mRNA sequence - var8 (public gi: 10434893) (SEQ ID NO: 221)  
GAACCCCCAAGTCCAGTTCTGGAAAGCTGGCGGCACCTGGACCGCGTGGATGCCGTGCTGGTGACCCAC  
CCTGGCGCCGACAGCTCCCCGGCTCAACAGCCTGCTGCCGCAAACCTGGCGGAGCGCTCCGAGGTGG  
CTGCTGGTGGGGGCTCCTGGGACGACAGGCTGCCAGGGCTCATCTCCCCAACCTGGGGTGTGTTCTT  
CAACGCCCTGCCAGGCCGCGTCCGGCTGGCGCGGGAGGATGAGGCCGAGCTGGCGCTGAGCCCTCTG  
GCCGAGCTGGGCATCACGCCCTGCCACTCAGCCGCCGGCCCGTGCACGCCAACCCACCGTGTCTTCG  
AGAAGATGGCGTGGCCGGCTGGACATGTATGTGCTGCACCCGCCCTGCCGGCGCCGAGCGCACGCT  
GGCCTCTGTGTGCCCTGCTGGCGACCCGCCGGCCGGAGAAGGTGGTGCCTGCTGTGTT

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CCCGTTGCACCCGCCGCTGCCCTGGACGCCCTGGTCGCCCTGCAGCACTTGAGGTTCCGTGAG  
AGCCCGTGGTGAACGCCAGGACCTGGAGGGCCGGCGAGCGAGAGCAAAGAGAGGGTGGGCTCCCC  
GGACAGCTGAAGAGAGAGGGCCTCCCTGGCCACCCACCTAGACCTGGCCAGGAGGCCCTGGGCTGGC  
CGCAAGGAGCCAGCACGGCTGAGGCCAACGCAAGACTGAGAAAGAAGGCCAGACCCCCGGAGTTGA  
AGAAAGACCCAAACCGAGTGTCTCCGGACCCAGCCGCGGGAGGTGCGCCGGCAGCCTCTGTGCC  
CAACCTCAAGAAAGCAATGCCAGGCCACCAAGCCCCGAAAGCCCCAGCACGTCCCACCTGTGCC  
TTCCCGCCGGTGGCAAATGACCCCGCAGCCCGCCAGCTCGATGTGGAGAAGCCAGCCCCCAGTG  
CAGCCTGGGCTCTCGGCTCCAGCTGGTGGCCACGCCAGCTGGAGCTGGGCGATCCAGCCGG  
GGAGGAGAAGGCACTGGAGCTGCCCTTGCGCCAGCTCAATCCAAGGCCAGCACACCCCTCCCTGAG  
TCCCACCGGAGCCCCGAGGCCAGGAGCGAGCGCTGTGCTGAGCCACTGCCGGGGGGAGGGCGGGC  
CAGACGCCACTAACAGTGGACCAACCCACGGTACCGACGCCCTCACTACCCGAGAGGTGGGCTCCCC  
GCACCTGACCGAGGGTGGAGCTCCCTGTGCGTGTGAGCAGGTGCTGCCGCATCCGCCACC  
AGTGGAGGCTGGCTGAGCTCCCGCTGCGTGGCCCCGGCGCGCTGGCTTCCCACACGATGTGG  
ACCTGTGCTGGTGTACCCCTGTGAATTGAGCATCGCAAGGGTGCCTAGGCACCCGACCTGCGTC  
CCCCGGCAGCTGAATGACAGCAGTGCCGGTACAGGAACGGCAGGTGGCTGGGGGGAGGAGACG  
CCACCCACATCGGTACGGAGTCCCTGTGCGTGTGAGCAGGTGCTGCCGCATCCGCCACC  
CGGAGACTCAGACGAAGACACAGAGGGCTTGAGTCCCTGCCACGCCCTTGCTGACCCCTCAA  
GGTCCCCCACCACCTGCCGTGACCCATCCAGCAGTGTGAGGAGATGTGCTGCCGCCTTCCCAGACA  
GCACGGCAAACGGAGAACGTCAGCCGACCCGGAAAGCCCCCTGGGGGCCACCCACTCACGCGCTGCCGCC  
CCAAAGCCACTCCAGTGGCTGCTGCCAAAACCAAGGGCTTGCTGGTGGGACCGTGCAGCCGACCACT  
CAGTGGCCGGAGTGGAGGCCAGTGAGAAGGGAGGGCCGGCACCCCTGTGAGCCACCCACCAAG  
ACTGCCACTCAGGCCGGCTGGGGTCAAGCCAGCAGCCGGCCGGGGTGTGAGCCACCCACCAAGTCCC  
CGGTACTCTGGACCTGGCTACCTGCCAGCAGGGAGCAGGCCACCTGGTGGATGAGGAGCTTTCA  
GCCGCTGGCGCCTGTACGTACAGTGGCAGGACCGCAGCGAAGGAGGAAGGCATGCCGCCGTC  
CTGGACCGCCTACTGGCAGCAAGCAGCATTGGACCGTGCAGGTGACCTGATCCCCACTTCG  
ACTCGGTGGCATGACAGTGGTACGAGACGACGCCGGCACCGCGCTGGCATCACGGTGT  
GGCAGCAACACCATGGTGTCCATGCAGGATGACGCCCTCCGGCTTGCAAGGTGGAGTTAGCCCCAT  
CGCCGACACGCCCTACTGCCAGCCAGCCGCTGTCCCTAGATTGCCACATCAGAAATAACTGTGA  
CTAC

Human VCY2IP1 mRNA sequence - var9 (public gi: 7022843) (SEQ ID NO: 222)  
CATCTCCCCAACCTGGGGTCGTGTTCTCAACGCCCTGCAGGCCGCTGGCGCTGGCCGGCTGGGCCGGAG  
GATGAGGCCAGCTGGCGTGGAGCTGGCTCTGGCGAGCTGGCATACGCCCTGCCACTCAGCCGCGGCC  
CCGTGCCAGCAAACCCACCGTCTTCGAGAAAGATGGCGTGGGACATGTATGTGCTGCA  
CCCGCCCTCCGCCGGCGCGAGCCAGCTGGCTCTGTGTGCGCCCTGCTGGTGTGGCACCCGCCGGC  
CCCGCGAGAGGGTGGCTGCGCTGCTGTTCCCCGGTTGACGCCAGGACCTGGAGGGCCGGGGCG  
TCGGCTGAGCACTTGAGGTTCTCTGAGAGGCCAGCTGGGACAGCTGAAGAGAGAGGGCTCTGGCCACCCACCT  
AGCCGAGAGCAAAGAGAGCGTGGGCTCCCGGGCAAGGAGGCCAGCAGGGCTGAGGGCCACGCAAGACTG  
AGACCTGGCAGGAGGCCCTGGGGTGGCCGCAAGGAGGCCAGCAGGGCTGAGGGCCACGCAAGACTG  
AGAAAGAAGCAAGACCCCGGGAGTTGAAGAAAAGACCCAAACCGAGTGTCTCCGGACCCAGCCGCC  
GGAGGTGCGCCGGGAGCCCTCTGTGCCAACCTCAAGAAGACGAATGCCAGGCCACCAAGGCC  
CGAAAGGCCAGCACCTCCACTCTGGCTCCGCCGGTGGCAAATGGACCCCGCAGCCGCCAGCC  
TCGGATGTGGAGAACCCAGGCCCTGGGGTGGCCGCAAGGAGGCCAGCAGGGCTGAGGGCCACGCTCA  
CAGCCTGGAGCTGGGCCGATCCAGCCGGGAGGAAGGCAGTGGAGCTGCCCTGGCCAGCT  
ATCCCAGGCCACGCACCCCTCCCTGAGTCCACGGGAGCCCCGAGAGGGCAGCGAGCGCTGTGACCAC  
TGAGCCCAGTGGGGGGGGAGGCCGGGGAGGCCAGCAGGCCACCCACAGTGACCAACCCACGGTGACCAC  
GCCCTCACTACCCCGAGGGTGGCTCCCCCGCAAGTGTGAGGCTGGCTGAGCCCTCCCGTGGCTGGCCAGCT  
GAGCAGGTGCTGCCCATCCGCCCCACAGTGTGAGGCTGGCTGAGCCCTCCCGTGGCTGGCCAGCT  
CGCGGGCTGCCATGGCACGGCACCTGCCAGCTGGGAGGAGACGCCACCCACATGGTCAAGCAGGAGTCCCT  
ACTCGGATCCCGTGCCCTGGCCCCGGTGCAGCAACTCAGACGAAGACACAGAGGGCTTGGAGTCCC  
TGGCCACGACCTTGTGCTGACCCCTCAAGGTCCCCCACCAGTGCCTGACCCATCCAGCATCTGCATG  
GTGGACCCCGAGATGCTGCCCCCAAGACAGCACGGAAACGTCAGGCCACCCGGAGCCCC  
TGGCCCGCCCAACTCACGCCAGCCGCCCCAAAGCCACTCCAGTGGCTGCTGCCAAAACCAAGGGCT  
TGCTGGTGGGACCGTGCCAGGCCAGCCACTCAGTGGCCAGGAGCTGAGGCCAGCTGAGAAGGGAGGCCAG  
CCCGCTGCCAGAAAGTCTCAACCCCAAGACTGCCACTCAGGCCAGGCCCCGGTGGGCTAGCCAGGCCAG  
CCGGGGTGTAGCCACCCACCAAGTCCCCGGTCTACCTGGACCTGGCTACGTGCTACAGTGGCCAGGAC  
CGCCCACTGGTGGATGAGGAGTTCTCCAGGCCAGCCGCTCTGGACCTGGCTACGTGCTACAGTGGCCAG  
CAGCGCAAGGAGGAAGGCATGCCGGCTCTGGACCGCTACTGGCAGCAAGCAGCATGGTACCGAGAGACGCC  
ACCTGCAGGTGACCCCTGATCCCCACTTCGACTCGGTGGCATGACAGTGGTACCGAGAGACGCC  
CCGGCACCGGCCCTGGGATCACGGTGTGGCATGACAGGATGACGCCCT  
CGGGCTGCCAGGGTGGAGTTCTAGCCCCATGCCACGCCAGCCCTGTCCCT

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AGATTCAAGCCACATCAGAAATAAAGTGTGACTACACTTG

Human VCY2IP1 Protein sequence - var1 (public gi: 22002953) (SEQ ID NO: 315)  
MAAVAGSGAAAAPSSLVVGSEFGSPGLLTYVLEELERGIRSWDVPGVNLDEQLKVFVSRSATFSS  
IVKGQSLHHRGDNLETLVLLNPSDKSLYDELRLNLLDPASHKLLVLAGLCLEETGELLQTGGFSPHHF  
LQLVKDRREIRDILATTTPPVOPPILTITCPFGDWQAQPAPAVPGLQGALRQLQLRNPPAQLPNSEGCLCE  
LEYVAESLEPPSPFELLEPPTSGGFLRLGRPCCYIFPGGLGDAAFFAVNGFTVLVNGGSNPKSSFWKLVR  
HLDRLDAVLVTHPGADSLPGLNSLLRRKLAERSEVAAGGGSWDDRLRRLISPNLGVVFVNACEAASRLAR  
GEDEAELALSLLAQLGITPLPLSRGPVPAKPTVLFKEKMVGVRIDMYVLHPPSAGAERTLASVCALLVWHP  
AGPGEKVVRLFPGCTPPACLLDGLVRLQHRLFLREPVTQPDLEGPGRAESKEVGSRDSSKREGLLAT  
HPRPGQERPGVARKEPARAEAPRKTEKEAKTPRELKKDPKPSVSRTQPREVRAASSVPNLKKTNAQAAP  
KPRKAPSTSHSGFPPVANGPRSPPSLRCGEASPPSAACGSPASQVLVATPSLELGPIPAGEEKALELPLAA  
SSIIPRRTPSPESHRSPAEGSERLSSLSPRGGEAGPDASPTVTTPTSLPAEVGSPHSTEVDESLSV  
SFEQVLPPSAPTSEAGLSSLPLRGPRARRSASPHVDLCLVSPCEFEHRKAVPMAAPAPASPGSSNDSSA  
QERAGGLGAEETPPTSVSESLPTSDSDPVPLAPGAADSDEDTEGFGVPRHDPLPDPLKVPPPLPDPSI  
CMVDPEMPLPKTARQTENVSRTKPLARPNSRAAAPKATPVAAAKTKGLAGGDRASRPLSARSEPSEKGG  
RAPLSRKSTSPTKATRGPSGSASSRPGVSATPPKSPVYLDLAYLPGSSAHLVDEEFFQRVRALCYVISG  
QDQRKEEGMRAVLDALLASKQHWDRDLQVTЛИPTFDSVAMHTWYAETHARHQALGITVLGNSNMVSMQDD  
AFPACKVEF

Human VCY2IP1 Protein sequence - var2 (public gi: 21739763) (SEQ ID NO: 316)  
PKMAAVAGSGAAAAPSSLVVGSEFGSPGLLTYVLEELERGIRSWDVPGVNLDEQLKVFVSRSATF  
SSIVKGQSLHHRGDNLETLVLLNPSDKSLYDELRLNLLDPASHKLLVLAGPCLEETGELLQTGGFSPH  
HFLQLVKDRREIRDILATTTPPVQOPPILTITCPFGDWQAQPAPAVPGLQGALRQLQLRNPPAQLPNSEGCLC  
EFLEYVAESLEPPSPFELLEPPTSGGFLRLGRPCCYIFPGGLGDAAFFAVNGFTVLVNGGSNPKSSFWKL  
VRHLDRLDAVLVTHPGADSLPGLNSLLRRKLAERSEVAAGGGSWDDRLRRLISPNLGVVFVNACEAASRL  
ARGEDEAELALSLLAQLGITPLPLSRGPVPAKPTVLFKEKMVGVRIDMYVLHPPSAGAERTLASVCALLVW  
HPAGPGEKVVRLFPGCTPPAYLLDGLVRLQHRLFLREPVTQPDLEGPGRAESKEVGSRDSSKREGLL  
ATHPRPGQERPGVARKEPARAEAPRKTEKEAKTPRELKKDPKPSVSRTQPREVRAASSVPNLKKTNAQA  
APKPRKAPSTSHSGFPPVANGPRSPPSLRCGEASPPSAACGSPASQVLVATPSLELGPIPAGEEKALELPL  
AASSIPRRTPSPESHRSPAEGSERLSSLSPRGGEAGPDASPTVTTPTSLPAEVGSPHSTEVDESL  
SFSFEQVLPPSAPTSEAGLSSLPLRGPRARRSASPHVDLCLVSPCEFEHRKAVPMAAPAPASPGSSNDSSA  
RSQERAGGLGAEETPPTSVSESLPTSDSDPVPLAPGAADSDEDTEGFGVPRHDPLPDPLKVPPPLPDPS  
SICMVDPEMPLPKTARQTENVSRTKPLARPNSRAAAPKATPVAAAKTKGLAGGDRASRPLSARSEPSEK  
GGRAPLSRKSTSPTKATRGPSGSASSRPGVSATPPKSPVYLDLAYLPGSSAHLVDEEFFQRVRALCYVI  
SGQDQRKEEGMRAVLDALLASKQHWDRDLQVTЛИPTFDSVAMHTWYAETHARHQALGITVLGNSNMVSMQ  
DDAFPACKVEF

Human VCY2IP1 Protein sequence - var3 (public gi: 21104446) (SEQ ID NO: 317)  
MGVGRLDMYVLHPPSAGAERTLASVCALLVWHPAGPGEKVVRLFPGCTPPACLLDGLVRLQHRLFLREP  
VVTQPDLEGPGRAESKEVGSRDSSKREGLLATHPRPGQERPGVARKEPARAEAPRKTEKEAKAPRELKK  
DPKPSVSRQPREVRAASSVPNLKKTNAQAAPKPRKAPSTSHSGFPPVANGPRSPPSLRCGEASPPSAA  
CGSPASQVLVATPSLELGPIPAGEEKALELPLAASSIPRRTPSPESHRSPAEGSERLSSLSPRGGEAGPD  
ASPTVTTPTVTTPSLPAEVGSPHSTEVDESLSVSEQVLPPSAPTSEAGLSSLPLRGPRARRSASPHVDL  
CLVSPCEFEHRKAVPMAAPAPASPGSSNDSSARSQERAGGLGAEETPPTSVSESLPTLSDSDPVPLAPGAA  
DSDEDTEGFGVPRHDPLPDPLKVPPPLPDPSI CMVDPEMPLPKTARQTENVSRTKPLARPNSRAAAPK  
ATPVAAAKTKGLAGGDRASRPLSARSEPSEKGGRAPLSRKSTSPTKATRGPSGSASSRPGVSATPPKSPV  
YLDLAYLPGSSAHLVDEEFFQRVRALCYVISGQDQRKEEGMRAVLDALLASKQHWDRDLQVTЛИPTFDS  
VAMHTWYAETHARHQALGITVLGNSNMVSMQDDAFPACKVEF

Human VCY2IP1 Protein sequence - var4 (public gi: 14250680) (SEQ ID NO: 318)  
MGVGRLDMYVLHPPSAGAERTLASVCALLVWHPAGPGEKVVRLFPGCTPPACLLDGLVRLQHRLFLREP  
VVTQPDLEGPGRAESKEVGSRDSSKREGLLATHPRPGQERPGVARKEPARAEAPRKTEKEAKTPRELKK  
DPKPSVSRQPREVRAASSVPNLKKTNAQAAPKPRKAPSTSHSGFPPVANGPRSPPSLRCGEASPPSAA  
CGSPASQVLVATPSLELGPIPAGEEKALELPLAASSIPRRTPSPESHRSPAEGSERLSSLSPRGGEAGPD  
ASPTVTTPTVTTPSLPAEVGSPHSTEVDESLSVSEQVLPPSAPTSEAGLSSLPLRGPRARRSASPHVDL  
CLVSPCEFEHRKAVPMAAPAPASPGSSNDSSARSQERAGGLGAEETPPTSVSESLPTLSDSDPVPLAPGAA  
DSDEDTEGFGVPRHDPLPDPLKVPPPLPDPSI CMVDPEMPLPKTARQTENVSRTKPLARPNSRAAAPK  
ATPVAAAKTKGLAGGDRASRPLSARSEPSEKGGRAPLSRKSTSPTKATRGPSGSASSRPGVSATPPKSPV  
YLDLAYLPGSSAHLVDEEFFQRVRALCYVISGQDQRKEEGMRAVLDALLASKQHWDRDLQVTЛИPTFDS  
VAMHTWYAETHARHQALGITVLGNSNMVSMQDDAFPACKVEF

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Human VCY2IP1 Protein sequence - var5 (public gi: 13938255) (SEQ ID NO: 319)  
DTDRSSTSVPSEQVLPSSAPTSEAGLSLPLRGPRARRSASPHVDVLCLVSPCEFEHRKAVPMAAPAPASP  
GSSNDSSARSQERAGGLGAEETPPPTSVESLPTLSDSDPVPLAPGAADSDDEDTEGFVPRHDPLPDPLKV  
PPPLPDPSSI CMVDPEMPLPKTARQTENVSRTKPLARPNSRAAAPPATPVAAKTKLAGGDRASRPLS  
ARSEPSEKGGRAPLSRKSTS PKTATRGPSGSASSRPGVSATPPKSPVYLLAYLPSGSSAHLVDEEFFOR  
VRALCYVISGQDQRKEEGMRAVLDALLASKQHWRDLQVTЛИPTFDSVAMHTWYAETHARHQALGITVLG  
SNSMVSMDQDAFPACKVEF

Human VCY2IP1 Protein sequence - var6 (public gi: 14042429) (SEQ ID NO: 320)  
MAAVAGSGAAAAPSSLLL VVGSEFGSPGLLTIVLEELERGIRSWDVGVCNLDEQLKVFSRHSATFSS  
IVKGQRLSHHRCDNLETLVLLNPSDKSLYDELRNLLDPASHKLLVLAGLCLEETGELLQQTGGFSPHHF  
LQLKDREIRDILATT PPPVQPPILTT CPTFGDWQAQPAPAVPGLQGALRLQLRNPPAQLPNSEGELCEF  
LEYVAESLEPPSPFELLEPTSGGFLRLGRPCCYI FPGGLGDAAFFAVNGFTVLVNGGSNPSSFWKLVR  
HLD RVD A L V T H P G A D S L P G L N S L L R R K L A E R S E V A A G G G S W D D R L R R L I P S N L G V V F F N A C E A A S R L A R  
GEDEAELALSLLAQLGITPLPLSRGPVPAKPTVLFEMGVGRLLDMYVLHPPSAGAERTLASVCALLVWHP  
AGPGEKVVVRVLFPGCTPPACLLDGLVRLQHLRFREP VVTPQDLEGPGRAESKESVGSRDSSKREGLLAT  
HPRPGQERPGVARKEPARAEAPRKTEKEAKTPRELKDPKPSVSRTPREVRAASSVPNLKKTNAQAAP  
KPRKAPSTSHSGFPVANGPRSPPSLRCGEASPPSAACGSPASQLVATPSLELGPIPAGEEKALEPLAA  
SSI PRPRTPSPE SHRSPAEGSERLSSLPLRGGEA PGDASPTVTTPTVTPSLPAEVGS PHSTEVD ELSV  
SFEQVLPSSAPTSEAGLSLPLRGPRARRSASPHVDVLCLVSPCEFEHRKAVPMAAPAPASPGSSNDSSARS  
QERAGGLGAEETPPPTSVESLPTLSDSDPVPLAPGAADSDDEDTEGFVPRHDPLPDPLKVPPPLPDPSI  
CMVDPEMPLPPQDSTANGERQPHPEAPGPPQLTRCRPQSHSSGCCQNQGACWWGPCQPTTQCPE

Human VCY2IP1 Protein sequence - var7 (public gi: 13623505) (SEQ ID NO: 321)  
MGVGRLD MYV LHPPSAGAERTLACV CALLVWHPAGPGEK VVRVLFPGCTPPACLLDGLVRLQHLRFREP  
VVT P QDLEGPGRAESKESVGSRDSSKREGLLATHPRPGQERPGVARKEPARAEAPRKTEKEAKTPRELKK  
DPKPSVSR T QPREVRAASSVPNLKKTNAQAAPKPRKAPSTSHSGFPVANGPRSPPSLRCGEASPPSAA  
CGSPASQLVATPSLELGPIPAGEEKALELPLAASSI PRPRTPSPE SHRSPAEGSERLSSLPLRGGEAGPD  
ASPTVTTPTVTPSLPAEVGS PHSTEVD ELSV SF EQVLPSSAPTSEAGLSLPLRGPRARRSASPHVDVL  
CLVSPCEFEHRKAVPMAAPAPASPGSSNDSSARSQERAGGLGAEETPPTSVSESLPTLSDSDPVPLAPGAA  
DSDEDTEGFVPRHDPLPDPLKVPPPLPDPSI CMVDPEMPLPKTARQTENVSRTKPLARPNSRAAAPP  
ATPVAAAKTKLAGGDRASRPLSARSEPSEKGGRAPLSRKSTS PKTATRGPSGSASSRPGVSATPPKSPV  
YLDLAYLPSGSSAHLVDEEFFQRVRALCYVISGQDQRKEEGMRAVLDALLASKQHWRDLQVTЛИPTFDS  
VAMHTWYAETHARHQALGITVLGSNSMVSMDQDAFPACKVEF

Human VCY2IP1 Protein sequence - var8 (public gi: 10434894) (SEQ ID NO: 322)  
MGVGRLD MYV LHPPSAGAERTLACV CALLVWHPAGPGEK VVRVLFPGCTPPACLLDGLVRLQHLRFREP  
VVT P QDLEGPGRAESKESVGSRDSSKREGLLATHPRPGQERPGVARKEPARAEAPRKTEKEAKTPRELKK  
DPKPSVSR T QPREVRAASSVPNLKKTNAQAAPKPRKAPSTSHSGFPVANGPRSPPSLRCGEASPPSAA  
CGSPASQLVATPSLELGPIPAGEEKALELPLAASSI PRPRTPSPE SHRSPAEGSERLSSLPLRGGEAGPD  
ASPTVTTPTVTPSLPAEVGS PHSTEVD ELSV SF EQVLPSSAPTSEAGLSLPLRGPRARRSASPHVDVL  
CLVSPCEFEHRKAVPMAAPAPASPGSSNDSSARSQERAGGLGAEETPPTSVSESLPTLSDSDPVPLAPGAA  
DSDEDTEGFVPRHDPLPDPLKVPPPLPDPSI CMVDPEMPLPKTARQTENVSRTKPLARPNSRAAAPP  
ATPVAAAKTKLAGGDRASRPLSARSEPSEKGGRAPLSRKSTS PKTATRGPSGSASSRPGVSATPPKSPV  
YLDLAYLPSGSSAHLVDEEFFQRVRALCYVISGQDQRKEEGMRAVLDALLASKQHWRDLQVTЛИPTFDS  
VAMHTWYAETHARHQALGITVLGSNSMVSMDQDAFPACKVEF

Human VCY2IP1 Protein sequence - var9 (public gi: 7022844) (SEQ ID NO: 323)  
MGVGRLD MYV LHPPSAGAERTLACV CALLVWHPAGPGEK VVRVLFPGCTPPACLLDGLVRLQHLRFREP  
VVT P QDLEGPGRAESKESVGSRDSSKREGLLATHPRPGQERPGVARKEPARAEAPRKTEKEAKTPRELKK  
DPKPSVSR T QPREVRAASSVPNLKKTNAQAAPKPRKAPSTSHSGFPVANGPRSPPSLRCGEASPPSAA  
CGSPASQLVATPSLELGPIPAGEEKALELPLAASSI PRPRTPSPE SHRSPAEGSERLSSLPLRGGEAGPD  
ASPTVTTPTVTPSLPAEVGS PHSTEVD ELSV SF EQVLPSSAPTSEAGLSLPLRGPRARRSASPHVDVL  
CLVSPCEFEHRKAVPMAAPAPASPGSSNDSSARSQERAGGLGAEETPPTSVSESLPTLSDSDPVPLAPGAA  
DSDEDTEGFVPRHDPLPDPLKVPPPLPDPSI CMVDPEMPLPKTARQTENVSRTKPLARPNSRAAAPP  
ATPVAAAKTKLAGGDRASRPLSARSEPSEKGGRAPLSRKSTS PKTATRGPSGSASSRPGVSATPPKSPV  
YLDLAYLPSGSSAHLVDEEFFQRVRALCYVISGQDQRKEEGMRAVLDALLASKQHWRDLQVTЛИPTFDS  
VAMHTWYAETHARHQALGITVLGSNGMVSMQDDAFPACKVEF

PCT/US04/06308

Unigene Name: SPG20 Unigene ID: Hs.118087

Human SPG20 mRNA sequence - var1 (public gi: 28436884) (SEQ ID NO: 367)  
AGTGTAAAGGAGTGGAGCTGGTCGCGCGCGCGCAGGGAGCTCGAGGAACGCCGGGC  
GCCCGAGGTCTGAAGGCGCAGAAATGGAGCAAGAGCCACAAAATGGAGAACCTGCTGAAATTAAAGATCA  
TCAGAGAAGCATATAAGAAGGCCCTTTTATTTGTTAACAAAGGTCTGAATACAGATGAATTAGGTCTGAGAA  
GGAAGAAGCAAAGAACTACTATAAGCAGGAAGAACCTGCTCAGAGGGATCAGCATTCTACAAAA  
GAGTCTGAACACACAGGTACTGGGTGGAAATCTGCTAGACAGATGCAACAGAAAATGAAAGAAACTCTAC  
AGAATGTACGCCACAGGTGGAAATTCTAGAGAAGGGCTTGGCACTTCTGAGAATGATCTTCAGGA  
GGTGCCTCAAGTTATTCAGAATTTCACCTAAAGACATGTGAAAAATTACAGAGCCTCAGTCTTT  
AGTCAGCTCTCAGCATGCTGAAGTAATGGAAACACCTCAACTCCAAGTGCAAGGGCAGTTGCTGCAC  
CTGCTCTCTGTCTTACCATCACAAAGTGTCCAGCAGAAGCTCTCTGTTACTCCTCAAGCTGC  
TGAAGGTCACTACACTGTATCCTATGAAACAGATTCTGGGGAGTTTCATCAGTTGGAGAGGAGTTTAT  
AGGAATCATTCTCAGCCACCGCTCTTGGACACCTTAGGGCTGGATGAGATGAATTGATTGATACCAA  
ATGGAGTACAGATTTTTGTTGAAATCTGCAAGGGAGGTTAGTGCACCTTGTATCTGGGTACCTTCG  
AATTGAGGTTTTGGATAATTCTCTGATACGGTTCTAAACCGTCTCCGGGTTCTCAGGTTGTT  
GACTGGTTATATCCTCTAGTCCCTGATAGATCTCGGTTCTGAAATGTAAGTGCAGGAGCCTACATGTT  
CTGATACAATGCTACAAGCAGCAGGATGCTTGTGGGGTCTGCTCTGAGTACAGAGGATGA  
TAGAGAGCTTTGAGGATCTGTTAAGGCAAATGCTGACCTTCTGGCTCAGGCAACTGGAAACAGAGCA  
GAAGAAGAAAATGAATTCCAAATCCCTGAAAGCAATAAGGATGTAAGTACAGTACATAAAGGAAAAGTGGAAAAGGGC  
GCACTGATGTGAAACAGTGGAGCAACAGGAAATAAGGATGTAAGTACAGTACATAAAGGAAAAGTGGAAAAGGGC  
TAAAGATACTTCAAGTGAAGAGTTAACCTGAGTACAGTACATTGTAACCATGTAAGGCCAGTCCAGAAGAAAAG  
CCAAAAGAATTACATGAATGGAGTAAAAAGTGGCTCACACATTGTCAGGTGCTTGGTGGAGTT  
GGGGTTAGTCAAAGGTGTGAGATTACTGGTAAGGCAATCCAGAAAGGTGCTTCTAAACTCCGAGAGCG  
GATTCAACCAGAAGAAAACCCGTGGAAGTTAGTCCAGCTGTACCAAGGGACTTTATAGCGAAGCAA  
GCTACAGGAGGAGCAGCAGGAGCTCAGTCCCTGGTTGATGGAGTTGACTGTACCAATTGCGTTG  
GAAAAGAACTAGCTCCACATGTCAGAAGCATGAAAGCAAATTGTTCCAGAATCTCTTAAAAGACAA  
AGATGGGAAATCCTCTGGATGGTGTATGGTTGAGCAGGAGTAGTGTCAAGGATTTCACGTCA  
TGGCAAGGATTGGAAATGTGCACTAAATGCATGTTAACATGTTTCAAGGAAACTGTACAAACTGTCA  
GATAACAATACGGATATAATGCAAGGAGCTACCCACCATCGGGTGGATTCTGGGTCAATGTTGGCGT  
AACTGCCTACAATATTAACACATTGGTATCAAAGCAATGGTAAAGGAAACTTCACAGGACAC  
ACTCTCTGAGGACTATCAGATAGTGTATAATTCTCAGAGGGAAAATCAAGAAGGAGCAGCAAATGTCA  
ACGTGAGAGGGAGAAGGTGAGCAGCAAGGAAGTAAAGGAGGAAAGAAGAAAGATAATGATGAAG  
TGCTGGGAATCACTTACCAAAGCTTATGAAATGGATGAAATTGTTGAAATAGGCAAATGTGGAAATT  
CCTCACAGATTAAACAGTATTGTTAAATGTTACATTCTACAAATTAAACTTTCTACAAATTGCA  
TGTCTCTATTAAAAGGAAATAAGTATTCTGCATCTGGCTTAGAAATGTAAGTTATTC  
AAGTTTATTGTTCCAAAGTGTAGCTAAATATTGTCAGGTTAAAGCTGATAGTACATGTTG  
TTCAAACCTGTTAACCTAATATTGAACTATTGTTATATCTGCTGTCTTCAGAAGGCAAATAGGAAAC  
TATATATTGCTTAAAATTGGCATTAGTAACCTTAATTCTTTTATAGAAGGAATGACTTAAAGTATT  
GTCCCCCTTTGCACTAATTGGATTAGATGCTCTCAGGTTCTCAGGTTCTCAGGTTCTCAGGTTCTCAGGTTCTC  
AAAAACTAAAGACTAAAGACTTGTCAAAACAGGGAAAGACTGATGAAAAGTAAAATGG  
ACTACTTTGTAACCTTACCTGTTGTTAGGAAATGGAATGTTCTTGTGATTAAATGAATAAAAATAG  
ATTATTACGTCTTTGTTGAGACTGTTGAGACTGTTGAGCTTAGGAAATTGGGACATGATTGATTGT  
ATTAAAATTGCAAGGTGATTATTACGTTAATTGGATTAAAAGTACTTCAAGAAATTAAAAAAA  
AAAAAAAAAATAAAAAATAAAAAAA

Human SPG20 mRNA sequence - var2 (public gi: 7023530) (SEQ ID NO: 368)  
AGGGAGCTCGAGGCAACGCCGGGGCGGGAGGTCTGGAGGGCGCAGAAATGGAGCAAGAGGCCACAAA  
ATGGAGAACCTGCTGAAATTAAAGATCATCAGAGAACATATAAGAAGGCCCTTTTATTTGTTAACAAAGG  
TCTGAATACAGATGAATTAGGTCAAGAGGAAGAACACTACTATAAGCAAGGAATAGGACACCTG  
CTCAGAGGGATCAGCATTCTACAAAGAGTCTGAACACACAGGTCTGGGGAAATCTGCTAGACAGA  
TGCAACAGAAAATGAAAGAAAATCTACAGAACATGTACGCAACAGGCTGGAAATTCTAGAGAAGGGCTTG  
CACTTCTCTGAGAACATGATCTCAGGAGGTGCCAAGTTATCTCAGAACCTTAAAGACATGTGT  
GAAAATTACAGAGGCCCTAGTCTTTAGTTCAGCTCTCAGCATGCTGAAGTAAATGAAACACCTCAA  
CTCCAAGTGCAAGGGCAGTTGCTGCACCTGCTCTGCTTACATCACAAAGTGTCCAGCAGAAC  
TCCTCCTGCTTATACCTCAAGCTGCTGAAGGTCACTACACTGTATCTATGAAACAGAATTCTGGGGAG  
TTTCATCAGTTGGAGAGGAGTTTATAGGAATCATTCTCAGGCCACCGCTCTGAGAACCTTGGGGCTGG  
ATGCAGATGAATTGATTGATACCAAATGGAGTACAGATTGTTTGTAAATCTCTGAGGGAGGTTAG  
TGCACCTTCGTATCTGGTACCTTCGAATTGAGGTTGGATAATTCTCTGATACGGTTCTAAAC  
CGTCCCTCCGGGTTCTTCAAGGTTGACTGGTTATATCCTCTAGTTCTGATAGATCTCCGGTTCTGA  
AATGTAACGCCCCAGCCTACATGTTCTGATACAAATGCTACAAGCAGCAGGATGCTTGTGGGGTCGT  
CCTGCTCTGAGTTACCAAGAGGATGAGAGAGCTCTTGAGGATCTGTTAAGGCAAATGTCTGACCTT

CGGCTCCAGGCCAACTGGAACAGAGCAGAAGAAGAAAATGAATTCAAATCCCTGGAAGAACTAGACCT  
CCTCTGACCAACTAAAGAACGCTCTGGCACTGATGTGAAACAGTTGGACCAAGGCATAAGGATGTACG  
TCATAAAGGAAAACGTGGAAAAGGGCTAAAGATACTTCAGTGAAGAAGTTAACCTGAGTCACATTGTA  
CCATGTGAGCCAGTCTCCAGAAGAAAAGCCAAAAGAATTACCTGAATGGAGTGAAAAGTGGCTCACAA  
TTTGTCAAGGTATTACAGTAACTGTTAATTTTCCCTGTATGACATTAAGCCTTGAACCAAATAAG  
ATATTGTTATTAGGAATACTGAGAAGATAATATTGTATTTGGTTAAATGATCAATTAGAAA  
TAAATGAGAAGGAACACTGTTGAAACATCAGATAATGTCAATAAGTATAAGTCAATTCTCCTGGCCTA  
TTATCTGTTTACTATTGGGAAAATGGATAGTGAAGGCTTCAGGAATCTCAAATTCTTAATAGTCT  
GAATCTAAAATTAGTTATGTTGTTCCCTTGAAGGCTTCAGGCTTAAACCTCCCCCTACCCCTGCCCC  
AGCTGTGGTCTGAATGTGCCCCCTCAAATTCTATAATTGAAATCTAACCCCTGAGGTGATGGTTTAG  
GAGGGGGGCTTGGAGGTGATTAGGTGATGAGGGAGGAGCCCTCATCAATGGATTAGTCCCCTTATA  
AAAGAGATCCCAGAGCTGCTTGTCTTCACTATGTGAGGAAGCAGTAAGAAGGTGTCATTCTATG  
AACCAAGGAAGTGGGCCCTCACAGAGCCAATGTACAGCACCTTAGTCTGTACTTCCAGCCTCTA  
GAATTGTGAGAATAATTGTGTTAAT

Human SPG20 mRNA sequence - var3 (public gi: 7023938) (SEQ ID NO: 369)  
GATAATTCTCTCGATACGGTTCTAACCGTCCTCCGGGTTCTTCAGGTTGTGACTGGTTATATCCTC  
TAGTTCTGATAGATCTCCGGTTCTGAAATGACTGCGGGAGCCTACATGTTCTGATACAATGCTACA  
AGCAGCAGGATGCTTGTGGGGTCGCTGTCTGAGTTACAGAGGATGATAGAGAGCTCTTGAG  
GATCTGTTAAGGCAAATGTCGACCTTCGGCTCAGGCCAACTGGAACAGAGCAGAAGAAGAAAATGAAT  
TCCAAATCCCTGGAAGAAGTACAGCCCTCTGACCAACTAAAGAAGCCTCTGGCACTGATGTGAAACA  
GTTGGACCAAGGCAAATAAGGATGTACGTCAAAGGAAAAGGCTAAAGATACTTCAAGT  
GAAGAAGTTAACCTGAGTCACATTGACCATGTGAGCCAGTCCAGAAGGAAAAGCCAAAAGAATTACCTG  
AACGGAGTAAAAAGTGGCTCACACATTGTGAGGTCTCTGGGAGTTGGTTAGTCAGGAA  
TGCTGAGATTACTGGTAAGGCAATCCAGAAAGGTGCTTCTAAACTCCGAGAGCGGATTCAACCAGAAGAA  
AAACCGTGGAGTTAGTCCAGTGTGACCAAGGGACTTTATATAGCGAAGCAAGCTACAGGAGGAGCAG  
CAAAGTCAGTCAGTCTCTGGITGATGGAGTTGACTGTGACCAAATTGCGTGGAAAAGAAACTAGCTCC  
ACATGTCAGAAGCATGGAAGCAAACATTGTTGAGGAACTCTTCAAGGATTTCAACTGCTGCAAGGATGGAAT  
CTGATGGTGTATGGTTGAGCAGCAAGTAGTGTCAAGGATTTCAACTGCTGCAAGGATGGAAT  
GTGAGCTAAATGCACTGTTAACATGTTCAAGGAAACTGTACAAACTGTCAAGGATACAAATACGGATA  
TAATGCGAGGAGAGCTACCCACCATGCGGTGGATTCTGCGGTCAATGTTGGCGTAACGCTCACAATT  
AACACATTGGTATCAAAGCAATGGTGAAGAAAAGTCAACACAAACAGGACACACTCTCCTGAGGACT  
ATCAGATAGTGTATAATTCTCAGAGGGAAAATCAAGAAGGAGCAGCAAATGTCAGTGAAGTGTGGGAATCACTTA  
GGGTGAGCAGACGAAGGAAGTAAAGGAGGCAAAGAAGAAGATAATGATGAAGTGTGGGAATCACTTA  
TACCAAGCCTTATGAAATGGATGAAATTGTTAATAGGAAATGTTGCAATTCCCTCACAGATAACCA  
GTATTTTAAATGTTATTCATCCTACAAATTAACTTCAATAATTGTCATGTTCTATTTAA  
GGAAAAGAATAAGTATTCTGCACTGGCTTAGAAATGTGAAGTTATATTCTCAAGTTATTGTTCC  
AAGTGTAGCTAAATATTGCAAGGTTAAATAGGCAAAAGAAGAAGATAATGATGAAGTGTGGGAATCACTTA  
CCTAATATTGAACTATTGTTATCTGCTGTCTTCAAGGCAAATAGGAAACTATATATTGCTTAA  
AATGGCATTAGTAACTTAAATTCTCAGAGGAATGCTTCAAAATTGTTAGTGTAACTAAACAAAACACTAAAG  
CTAATTGTGGATTGTTAGTGTCTTCAAAACAGGGAAAGACTGATGAAAGTAAAGGACTACTTTGTAACCT  
AATTCTCAAAAACCTGTTCAAAACAGGGAAAGACTGATGAAAGTAAAGGACTACTTTGTAACCT  
ACCTGTTGTAGGAATGGTCTTGTGATTAAATGAATAAGGAAACT

Human SPG20 mRNA sequence - var4 (public gi: 16553694) (SEQ ID NO: 370)  
GTGCATTTCTTCAGTCCTGGAAAGGAAATCATAGTATTGCCCCAAAGGATTGCTGTTGAAAATG  
GAGCAAGAGCACAATGGAGAACCTGCTGAAATTAAGATCATCAGAGAACATATAAGAAGGCCTTT  
TATTGTTAACAAAGGTCTGAATACAGATGAATTAGGTCAAGAAGGAAGCAAGAACACTATAAGCA  
AGGAATAGGACACCTGCTCAGAGGGATCAGCATTCTCATCAAAGAGTCGAAACACACAGGCTCTGGG  
GAATCTGCTAGACAGATGCAACAGAAAATGAAAGAAAACCTACAGAATGATCTCGTATCCTGGTACCT  
TCGAATTGTGAGGTTTGGATAATTCTCTGATACGGTTCTAAACCGTCTCCGGGTTCTCAGGTT  
TGTGACTGGTTATATCCTCTAGTGTGATAGATCTCCGGTTCTGAAATGACTGCGGGAGCCTACATGT  
TTCTGATACATGCTACAGCAGCAGGATGCTTGTGGGGTCTGCTCTGAGTTACAGAGGA  
TGATAGAGAGCTTTGAGGGATCTGTTAGGCAAATGTCGACCTTCGGCTCCAGGCCACTGAAACAGA  
GCAGAAGAAGAAAATGAATTCCAATCCCTGGAGAACACTGACCCCTCTGACCAACTAAAGAAGCCT  
CTGGCACTGATGTGAAACAGTGGACCAAGGGCAATAGGATGTACGTCAATAAGGAAACGTGAAAAAG  
GGCTAAAGGATACCTCAAGTGAAGAAGTTAACCTGAGTCACATTGACCATGTGAGGCCAGTCCAGAAGAA  
AAGCCAAAAGAATTACCTGAAATGGAGTAAAAAGTGGCTACAAACATTGTCAGGTGCTTCTGGGTGA  
GTGGGGTTAGTCAGGAGTGTGAGATTACTGGTAAGGCAATCCAGAAAAGGTGCTTCTAAACTCCGAGA  
GGGGATTCAACCAGAAGAAAACCCGTGGAAGTTAGTCCAGTGTCAACCAAGGGACTTATATAGCGAAG  
CAAGCTACAGGAGGAGCAGCAAAGTCAGTCAGTCTCTGGTGTGAGGGTTGACTGTAGCAAATTGCC  
TTGGAAAAGAACTAGCTCCACATGTCAAGAAGCATGGAAGCAAACCTGTTCCAGAATCTCTTAAAGA

Figure 36 part - 146

РСТ/У504/06308

CAAAGATGGAAATCCTCTGGATGGTGTATGGTAGCAGCAAGTAGTGTCAAGGATTTCACACT  
GTCTGGCAAGGATTGGAATGTGCAGCTAAATGCATCGTAACAATGTTCAGCAGAAACTGTACAAACTG  
TCAGATACAATACCGATAATGCAGGAGAACGCTACCCACCATGCCGTGGATTCTGCCGTCAATGTTGGCG  
TAACTGCTACAAATATTGACAACTGGTATCAAAGCAATGGTGAAGAAAATGCAACACAAACAGGACA  
CACTCTCCTGAGGACTATCAGATAGTGTATAATTCTCAGAGGGAAAATCAAGAAGGAGCAGCAAATGTC  
AACGTGAGAGGGGAGAAGGATGAGCAGACGAAGGAAGTAAAGGAGGCAAAGAAGAAAGATAATGATGAA  
GTGCTGGAAATCACTTACCAAGCCTATGAAATGATGAAATTGTTAAATAGGCAAATGTGAAAT  
TCCTCACAGATTAACAGTATTTTAAATGATTCTCCTACAAATTAACTTCATAAATTTATGGC  
ATGTCTCTATTTAAAGGAAAAGAATAAGTATTCTGCATCTGCCCTAGAAATGTGAAGTTATATCT  
CAAGTTATTTTCTCAAGTGTAGCTAAATATTTCAGGTTAAATAGCTGATAGTACATGTGTT  
GTTCAAACTTGTAAACCTAAATATTGGAACATTCTTATATCTGCTGTCTTCAGAAGGCAAATAGGAAA  
CTATATATTGCTTAAACATTGGCATTTAGTAACCTTAAATTCTTTATAGAAGGAATGACTTAAAGTAT  
TGTCCCCCTCTTTTGCACTAAATTGTTGATTAGATGCTCTCAAAATTTCAGTGTGAAGCTAAA  
CAAAAACAAAATCTAAGAATTCTCAAAAAAACTTGTCTCAAAACAGGGAAAGACTGATGAAAAGTAAATG  
GACTACTTTGTAACCTACCTGTTGTTAGGAAATGGAATGGTCTCTTGATTAAATGAATAAAAATA  
GATTATTACGTC

Human SPG20 mRNA sequence - var5 (public gi: 21654722) (SEQ ID NO: 371)  
ATGGAGCAAGAGCCACAAAATGGAGAACCTGCTGAAATTAAAGATCATCAGAGAAGCATATAAGAAGGCC  
TTTATTGTAAACAAAGGTCTGAATACAGATGAATTAGGTAGAAGGAAGAAGCAAAGAACTACTATAA  
GCAAGGAATAGGACACCTGCTCAGAGGGATCAGCATTCTACAAAAGAGTCAGAACACACAGGTCCTGG  
TGGGAATCTGCTAGACAGATCAACAGAAAATGAAAGAACTCTACAGAATGTACGCACCAGGCTGGAAA  
TTCTAGAGAAGGGCTTGCCACTCTCTGAGAATGATCTTCAGGAGGTGCCAAGTTATATCCAGAATT  
TCCACCTAAAGACATGTGTGAAAAATTACCAAGAGCCTCAGTCTTGTAGTCAGCTCTCAGCAGTCAG  
GTAAATGAAACACCTCAACTCCAAGTGCAGGGCAGTGTGACCTGCTCTCTGCTTACCATCAC  
AAAGTTGCCCCAGCAGAAGCTCCCTGCTTATACTCCCAAGCTGAGGTCACTACACTGTATCCTA  
TGGAAACAGATTCTGGGGAGTTTCATCAGTGGAGGAGTTTATAGGAATCTCTCAGCCACCGCCT  
CTTGAGACCTTAGGGCTGGATGCAGATGAATTGATTTGATACCAAATGGAGTACAGATTTTTGAA  
ATCCTGCAGGGGAGGTTAGTGCACCTTCGTATCCTGGGTACCTTCGAATGTGAGGTTTGGATAATT  
TCTCGATACTGGTCTAAACGTTCTCCCGGGTTCTTCAGGTTGTACTGGTTATATCCTCTAGTTCT  
GATAGATCTCCGGTTCTGAAATGTACTGGGGAGCCTACATGTTCTGATAACAATGCTACAAGCAG  
GATGCTTGTGGGGTCTGCTCTGAGTTACAGAGGATGATAGAGAGCTTTGAGGATCTGTT  
AAGGCAAATGTCGACCTCGGTCCAGGCCAACTGGAACAGAGCAGAAGAAGAAAATGAACTTCAAATC  
CCTGGAAAGAACTAGACCCCTCTGACCAACTAAAAGAAGCCTCTGGCACTGATGTGAAACAGTTGGACC  
AAGGCAATAAGGATGTACGTATAAGGAAAAGTGGAAAAAGGCTAAAGATACTTCAGTGAAGAAGT  
TAACCTGAGTCACATTGTAACATGTGAGCCAGTCCAGAAGAAAAGCAGGAAATTACCTGAATGGAGT  
GAAAAGTGGCTCAACATTGTCAGGTGCTCTGGGTGAGTTGGGTTAGTCAAAGGTGCTGAGA  
TTACTGGTAAGGCAATCCAGAAAGGTGTTCTAAACTCCGAGAGCGGATTCAACCAGAAGAAAACCGT  
GGAAGTTAGTCCAGTGTCAACAGGGACTTTATAGCGAAGCAAGCTACAGGAGGAGCAGCAAAGTC  
AGTCAGTTCTGGTTGATGGAGTTGCACTGTGAGCAAATTGCGTTGGAAAAGAACTAGCTCCACATGTCA  
AGAACGATGGAAGCAAACCTTGTCTCAGAATCTCTTTAAAGACAAAGATGGGAAATCTCTCTGGATGG  
TGCTATGGTTGTAGCAGCAAGTAGTGTCAAGGATTTCACAGTGTGAGGATTGGAAATGTGCA  
AAATGCACTGTTAACATGTTCTAGCAGCAAACAGTGTACAAACTGTGAGATAACAAATACGGATATAATGCA  
GAGAACGATCCCACCATGCGGTGATTGCGGTCAAGTGTGGGTAAGTGCCTACAAATTAAACACAT  
TGGTATCAAAGCAATGGTGAAGAAAATGCAACACAAACAGGACACACTCTCCTGAGGACTATCAGATA  
GTTGATAATTCTCAGAGGGAAAATCAAGAAGGAGCAGCAAATGTCACGTGAGAGGGGAGAAGGATGAGC  
AGACGAAGGAAGTAAAGGAGCCAAAGAAGAAGAAGATAAATGA

Human SPG20 mRNA sequence - var6 (public gi: 22074831) (SEQ ID NO: 372)  
 GCGGCCGCGCAGGGAGCTCTGAGGCAACGCCGGGGCGCCCGAGGTCTGGAAGGCGCAGAAATGGAGCAA  
 GAGCCACAAAATGGAGAACCTGCTGAAATTAAAGATCATCAGAGAACATATAAGAAGGCCTTTATTTG  
 TTAACAAAGGCTGAATACAGATGAATTAGGTAGAGAAGAACAAAGAACACTATAAGCAAGGAAT  
 AGGACACCTGCTCAGAGGGATCAGCATTTCATCAAAAGAGTCTGAACACACAGGTCTGGTGGAATCT  
 GCTAGACAGATGCAACAGAAAATGAAAGAAACTCTACAGAAATGTACGCACCAGGCTGAAATTCTAGAGA  
 AGGGTCTGCCACTTCTCTGCAAGATGATTCAGGAGGTGCCAAGTTATATCCAGAAATTCCACCTAA  
 AGACATGTGTAAAAATTACCAAGAGCCTCAGTTAGTTAGTTCAGGCTCTCAGCATGCTGAAGTAAATGGA  
 AACACCTCAACTCCAAGTGCAGGGGCAGTTGCTCACCTGCTCTCTGTCTTACCATCACAAAGTTGTC  
 CAGCAGAAGCTCTCTGCTTAACTCTCAAGCTGTAAGGTCAACTACACTGTATCCTATGGAACAGA  
 TTCTGGGAGGTTTACTAGTTGGAGAGGGTTTATAGGAATCTCAGCCACCGCCTTGTAGGACC  
 TTAGGGCTGGATGCAAGATGAATTGATTTGATACCAAATGGAGTACAGATTGTTGTAAATCTGCGAG  
 GGGAGGTAGTGCACCTTCGATCCTGGTACCTTCGAATTGTGAGGTTTGGATAATTCTCTCGATAC  
 GGTTCTAAACCGTCTCCGGGTTCTCAGGTTGTGACTGGTTATATCCTCTAGTTCTGATAGATCT

CCGGTTCTGAAATGTACTGCGGGAGCCTACATGTTCTGATAACATGCTACAAGCAGCAGGATGCTTG  
TGGGGTCGCTCTGCTCTGAGTTACAGAGGATGATAGAGAGCTTGGAGGATCTGTTAAGGCAAAT  
GTCTGACCTTCGCTCCAGGCCACTGGAACAGAGCAGAAGAAGAAAATGAATTCCAATCCCTGGAAGA  
ACTAGACCCTCTGACCAACTAAAAGAAGCCTCTGGCACTGATGTGAAACAGTTGGACCAAGGCAAATA  
AGGATGTACGTACATAAGGAAACAGTGGAAAAAGGGCTAAAGATACTTCAGTGAAGAAGTTAACGTGAG  
TCACATTGTACCATGTGAGGCCAGITCCAGAAGAAAAGCCAAAAGAATTACCTGAATGGAGTGAAGAAAGTG  
GCTCACAAACATTGTGAGGTCTCTGGTACTGGGGTTAGTCAAAGGTGCTGAGATTACTGGTA  
AGGCAATCCAGAAAAGGTGCTCTAAACTCCGAGAGCGGATTCAACCAGAAGAAAAACCGTGGAAAGTTAG  
TCCAGCTGTACCAAGGGACTTATAGCGAAGCAAGCTACAGGAGGAGCAGCAAAGTCAGTCAGTCT  
CTGGTGTGGAGTTGACTGTAGCAAATTGCGTTGAAAAGAACTAGCTCCACATGTCAAGAACATG  
GAAGCAAACTTGTTCCAGAATCTCTAAAAAGACAAAGATGGAAATCTCTCTGGATGGTGCTATGGT  
TGTAGCAGCAAGTAGTGTCAAGGATTTCACACTGTCTGGCAAGGATTGGATGTGAGCTAAATGCATC  
GTTAACATGTTCAAGCAGAAACTGTACAAACTGTCAAGATAAAACGGATATAATGCAAGGAGAAGCTA  
CCCACCATGCGGGATTCTGCGGTCAATGTTGGCTACTGCCTACAATATAACAAACATTGGTATCAA  
AGCAATGGTGAAGAAAATGCAACACAAACAGGACACACTCTCTTGAGGACTATCAGATAGTTGATAAT  
TCTCAGAGGAAAATCAAGAAGGAGCAGCAAATGTCAACGTGAGGGAGAAGGGATGAGCAGACGAAGG  
AAGTAAAGGAGCAGAAAAGAAGATAATGTGAAGTGTGGATTCTCTCACAGATAACCAAGCCTATGAA  
ATGGATGAAATTGGTAAATAGGCAATGTGGATTCTCTCACAGATAACCAAGCCTATGAA  
TCATCTCACAATTAACTCTAACTTATGGCATGTCTCTATTAAAAGGAAAAGAATAAGTATT  
CTTGCATCTGGCTTAGAATGTGAAGTTATTCACAGTTGTTCAACCTGTTAAACCTAATATTGAACATT  
TTTATATCTGCTGTCTTCAGAAGGCAAATAGGAAACTATATATTGCTAAAAATTGGCATTAGTAAC  
CTTAATTCTTTATAGAAGGAATGACTTAAAGTATTGTCCTCTTTGCACTAATTGGAATTCTT  
TAGATGCTCTCAAATTTCAGTGTAAAGCTAAACAAAACCTAAAGAATTCTCAAAAAACTT  
GTTAAAACAGGGAAAGACTGATGAAAAGTAAATGGACTACTTTGTAACTTACCTGTTGGTAGGAAA  
TGGAAATGGTCTTTGATTAAATAAAATAAAATAGATTATTACGTCTTGATTGAGACTGTATTGT  
TATGAGCCTAGGAAATTGGGAACATGATTGATTGATTAACTTCAAGTGAATTATCAGCTTAAT  
TGGATTAAAAGTACTTCAGAAGAAATTAACTTATCATATCTGCTCTGTTTCAAAAGGTTAAAACCTT  
GTAAAAAAATATATATAAAACATTGAGTTACTAATGGTAAACATTTTTATTCTGGATTGGTCATTG  
GAATTTATTTAAAGACAAGTTAAAGGAAAGGTTCTATTCAATACTAGGGTAAAGAATATGAAA  
ACCTTAGCGTAATCCATGGGATAGGCATTATGGTTCCACTTGGCAGAAGGCAGACTATTACAGC  
CCTATTACTTACATAGGCTAAAACATGTAACTAAACCTAATGGTATTAAATTGTTATTGA  
ATTAAAGAGATTGGTATTAGTTCATAGCTGTAGTCCATTCTAATAATTCTGATCTCTAGGGCTAC  
TTAATTAGACATTATTGAGCTGTCTGAAGAATGCACTTTATGAATTAAAAGTGAATTGCTGACCT  
CGTATCACATGAGCTTATATTGGGAACACATAGAACATGATGGAGGCTTCTAAGGCCAAGGATAA  
TGTACTAGTTGTTAAATGGAATAAAAGTGAAGTGGTAAAT

Human SPG20 mRNA sequence - var7 (public gi: 20070809) (SEQ ID NO: 373)  
GGCGCGCGTGTGCGGGCTCTGTGGCGGGAGCGAGGCCAGGGCGGGCCGTGCGGCCGCGTGCACGC  
GAAGCGTTCGAGAGCGCGCGTGGAAACGTCTTGGTGTGCCACGGCAAGCGCGCGCGAGGCCCTGGGA  
ACCTCGGGACGGCCCCCGCGAGCGCAGCGGCCAGTAGTCATCTTACTGGGATTGGGAAGCAAC  
AGGGCTGTGTGGGTAACCTGCCACCTTAAAGTGGAAATCAGAAATGGAGCAAGAGGCCACAAAATGGAGA  
ACCTGCTGAAATTAAAGATCATCAGAGAACATATAAGAAGGCCCTTTATTGTTAAACAAAGGTTCTGAAT  
ACAGATGAATTAGGTCTAGAGGAAAGAACACTAACTATAAGCAAGGAATAGGACACCTGCTCAGAG  
GGATCAGCATTTCATCAAAGAGCTGTAAGCACACAGGTCTGGGAAATCTGCTAGACAGATGCAACA  
GAAATGAAAGAAAATCTACAGAAATGTCAGCACCAGGCTGGAAATTCTAGAGAAGGGTCTGCACTTCT  
CTGCGAAATGATCTCAGAGGTGCCAACAGTTATATCCAGAATTCCACCTAAAGACATGTTGAAAAAT  
TACCAAGGCTCAGTCTTTAGTCAGCTCTCAGCATGCTGAAGTAAATGGAAACACCTCAACTCCAAG  
TGCAGGGCAGTTGCTGACCTGCTCTGCTTACCATCACAAAGTGTCCAGCAGAAGCTCTCCT  
GCTATACTCTCAAGTGTGAAGGTCACTACACTGTATCTATGGAAACAGATTCTGGGAGTTTCT  
CAGTTGGAGAGGGAGTTTATAGGAATCATTCTCAGCCACCGCTCTTGAGACCTTAGGGCTGGATGCA  
TGAATTGATTGATACCAAATGGAGTACAGATTGTTGAAATCTGCAAGGGGAGGTTAGTGCACCT  
TCGTATCTGGTACCTTCAATTGTGAGGTTTGGATAATTCTCTCGATACGGTTCTAAACCGTCTC  
CCGGTTTCTCAGGTTGTGACTGGTATATCTCTAGTCTCTGATAGATCTCGGTTCTGAAATGTAC  
TGGGGAGCCTACATGTTCTGTACAAATGCTACAAGCAGCAGGATGCTTGTGGGGGCTGTCCTGTC  
TCTGAGTTACAGAGGATGATAGAGAGCTTGGAGGATCTGTTAAGGCAAATGTCAGCCTTCGGCTC  
AGGCCAACTGGAACAGAGCAGAAGAAGAAAATGAATTCCAATCCCTGGAAGAACTAGACCCCTCT  
CCAACATAAAAGAAGCCTCTGGCACTGATGTGAACAGTTGGACCAAGGCCAATAAGGATGTACGT  
GGAAAACGTGAAAAAGGCTAAAGATACTTCAGTGAAGAAGTTAACCTGAGTCACATTGTACCATGT  
AGCAGTTCCAGAAGAAAAGCCAAAAGAATTACCTGAATGGAGTGAAGAAAGTGGCTACAACATTGTC  
AGGTGCTTCTGGGTGAGTTGGGTTAGTCAGGTGCTGAGATTACTGGTAAGGCAATCCAGAAAGGT  
GCTTCTAACTCCAGAGGCGGATTCAACCAGAAGAAAAACCGTGGAAAGTTAGTCCAGCTGT  
GACTTTATAGCGAAGCAAGCTACAGGAGGAGCAGCAAAGTCAGTCAGTCTGTTGATGGAGTTG

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CACTGTAGCAAATGCGTTGGAAAAGAACTAGCTCACATGTCAAGAAGCATGGAAGTCAAACTTGTCC  
AGAATCTAAAAAGACAAAGATGGAAATCTCCCTGGATGGTGTATGGTTGTAGCAGCAAGTAGT  
GTTCAAGGATTTCAACTGTCTGGCAAGGATTGGAATGTGCAGCTAAATGCATCGTTAACATGTTCA  
CAGAAACTGTACAAACTGTCAGATAACAAATACGGATAATGCAGGAGAAGCTACCCACCATGCGGTGGA  
TTCTGCGGTCAATGTTGGCTAACGCTACAATATTAAACAACATTGGTACAAAGCAATGGTGAAGAAA  
ACTGCAACACAAACAGGACACACTCTCCGTGAGGACTATCAGATAGTGTATAATTCTCAGAGGGAAAATC  
AAGAAGGAGCAGCAAATGTCAACCGTGAGAGGGAGAGGATGAGCAGACGAAGGAAGTAAAGGAGGCAA  
AAGAAGATAAATGATGAAGTGTCTGGAAATCACTTATACAAAGCCTATGAAATGGATGAAATTGGT  
TAATAGGCAAATGTGGAAATCCTCACAGATAACCGTATTGTTAAATGTTATGATTCACTCCTACAAATTA  
ACTTICATATAATTGCACTCTCTATTAAAGGAAAAGAATAAGTATTCTGCATCTGGCTTA  
GAAATGTGAAGTTATATTCTCAAGTTATTGTTCAAGTGTAGCTAAATATTGTCAGGTAAGGAAATA  
AAGCTGATAGTACATGTGTTCAACCTGTTAAACCTAATATTGAACTATTGTTATATCTGCTGTCT  
TTCAGAAGGCAAATAGGAAACTATATATTGCTAAAATTGGCATTAGTAACCTTAACTCTTTTATA  
GAAGGAATGACTAAAGTATTGCCCCCTTTTGCACTATTGGAATTGTTAGATGCTTCTCAAAA  
TTTTCACTGTGTAAGCTAAACAAAACAAACTAAAGAATTCTCAAAACACTGTTCAAAACAGGGAAA  
GACTGATGAAAAGTAAAATGGACTACTTTGTAACCTACCTGTTGAGGAAATGGAATGGTCTCTTG  
ATTAAAATGAATAAAAATAGATTATTACGTCTTGATTGAGACTGTATTGTTATGAGCCTAGGAAAT  
TTGGAACATGATTGATTGATTAAATTCGAAGTGATTATTACAGCTTAATTGGATTAAAAGTAC  
TTCAAGAAAAAAAAAAAAAA

Human SPG20 mRNA sequence - var8 (public gi: 3043743) (SEQ ID NO: 374)

GCAGGCCGCGCAGGGAGCTCTGAGGCAACGCCGGGCGCCGAGGTCTGGAGGCGCAGAAATGGAGCAA  
GAGCCACAAAATGGAGAACCTGCTGAATTAAGATCATCAGAGAACATATAAGAAGGCCTTTTATTG  
TTAACAAAGGTCTGAATACAGATGAATTAGGTCAAGAGAACAGAAACTACTATAAGCAAGGAAT  
AGGACACCTGCTCAGAGGGATCAGCATTCATCAAAGAGTCTGAACACACAGGTCTGGGTGGGAATCT  
GCTAGACAGATGCAACAGAAAATGAAAGAACACTACAGAATGTACGCACCAGGCTGAAATTCTAGAGA  
AGGTCTTGCACATTCTCTGAGAATGATCTCAGGAGGTGCCAAGTTATATCCAGAAATTCCACCTAA  
AGACATGTGAAAAATTACAGAGCCTCAGCTTTAGTTCACTCAGCAGCATGCTGAAGTAATGGA  
AACACCTCAACTCCAAGTGCAAGGGGAGTGTGCTGCACCTGCTCTGTCTTACCATCACAAAGTTGTC  
CAGCAGAAGCTCCTCTGCTTAACTCCTCAAGCTGCTGAAGTCACTACACTGTATCCTATGGAACAGA  
TTCTGGGAGTTTCATCAGTTGGAGAGGAGTTTATAGGAATCATTCTCAGGCCACCGCCTTGTGAGACC  
TTAGGGCTGGATGCAAGATGAAATTGATACCAATGGAGTACAGATTTTTGTAATTCCTGAG  
GGGAGGTTAGTCACCTCTGTTCTGGTACCTTCAGGTTGTGACTGGTTATATCCTCTAGTTCTGATAGATCT  
GGTTCTAAACCGTCTCCGGGTTCTCAGGTTGTGACTGGTTATATCCTCTAGTTCTGATAGATCT  
CCGGTTCTGAAATGACTGCGGGAGCCTACATGTTCTGATAGAGAGACTCTTGAGGATCTGTTAGGCAAAT  
TGGGGCTGTCCTGCTCTGAGTTACAGAGGATGATAGAGAGACTCTTGAGGATCTGTTAGGCAAAT  
GTCTGACCTTCGGCTCAGGCCAACTGGAAACAGAGCAGAAAGAGAAAATGAAATTCCAAATCCCTGGAAGA  
ACTAGACCCCTCTGACCAACTAAAAGAAGCCTGCACTGAAACAGTGGCAGGAGCAGAAAAGCTCAGTCAGTT  
AGGATGTAACGTCAAAAGGAAACGTTGAAAAGGGCTAAAGATACTTCAAGTGAAGAAGTTAACCTGAG  
TCACATTGACCATGTGAGCCAGTTCCAGAAGAAAAGCCAAAAGAATTACCTGAATGGAGTGAAGGAA  
GCTCACAAACATTGTCAGGTGTTCTGGGTGAGTTGGGGTTAGTCAGGAGTGTGAGATTACTGGTA  
AGGAATCCAGAAAGGTGCTTCTAAACTCCGAGAGCGGATTCAACCAGAAGAAAACCCGTGGAAGTTAG  
TCCAGCTGTCACCAAGGGACTTTATATAGCGAAGCAAGCTACAGGAGGAGCAGAAAAGCTCAGTCAGTT  
CTGGTTGATGGAGTTGCACTGTAGCAAATTGCGTTGAAAAGAAACTAGCTCCACATGTCAAGAACAG  
GAAGCAAATTGTTCCAGAATCTCTTAAAGACAAGATGGAAATCTCTGAGGATGGTGTATGGT  
TGTAGCAGCAAGTAGTGTCAAGGATTTCACACTGTCTGGCAAGGATTGGAATGTGCAGCTAAATGCATC  
GTTAACAAATGTTCAAGCAGAAACTGTACAAACTGTGAGATAACAAATACGGATAATATGAGGAGAAGCTA  
CCCACCATGCGGTGGATTCTGCGGTCAATGTTGGCTAACGCTACATTAACAAACATTGGTATCAA  
AGCAATGGTGAAGAAAAGTCAAGAAGGAGCAGCAAATGTCACAGTGAGAGGGAGAAGGATGAGCAGACGAAG  
TCTCAGGGAAAATCAAGAAGGAGCAGCAAATGTCACAGTGAGAGGGAGAAGGATGAGCAGACGAAG  
AAGTAAAGGAGGAGCAAAGAAGATAATGATGAAGTGTGAGGAAATCACTTACCAAAAGCCTATGAA  
ATGGATGAAATTGTTAAATAGGAAATGTGGAATTCTCAGATAACAGATAACCGTATTGTTAAATGTT  
TCATTCTACAAATTACATTTCATAAATTGTCAGTGTCTTCTATTAAAAGGAAAAGAATAAGTATT  
CTTGCACTCTGGCTTAAAGGTTCAAGTGTGAGTTATTCTCAAGTTATTGTTCTGTTAAACCTAATATTGAA  
ACTATTGTTGAGGTTAAAGGTTCAAGCTGATAGTACATGTGTTGTTCAACCTGTTAAACCTAATATTGAA  
ACTATTGTTGAGGTTAAAGGTTCAAGCTGATAGTACATGTGTTGTTCAACCTGTTAAACCTGTTAGGAA  
CTTAATTCTTTATAGAAGGAATGACTAAAGTATTGTCCTCTTTTGTGACTAAATTGTTGAGGTTTTT  
TAGATGCTTCTCAAAATTTCAGTGTGAGCTAACAAAACAAACTAAAGAATCTCAAAACTTCTGTTAGGAAA  
GTTCAAAACAGGGAAAGACTGATGAAAGTAAAGTAAAGGACTACTTTGTAACCTACCTGTTGTTAGGAAA  
TGGAAATGGTCTCTTGTTGATTAAAATGAAATAAAAATGATTATTACGTCTTGTATTGAGACTGTATTGT  
TATGAGCCTAGGAAAATTGGGAACATGATTGATTGTTATTGAGACTGTATTATCAGCTTAAAT  
TGGATTAAAAGTACTTCAGGAAATTATTATCATATCTGCTCTGTTCTGTTCTGTTCAAAAGGTTAAA  
GTAAAAAAATATATAACAAATTGAGTTACTAATGGTAAACATTCTGGGATTGGTCAATTG

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PCT/U504/06308

GAATTATATAAGACAAGTTATTAAGGAAAGGTTCTATTCTAAATCAGGGTAAAGAATATGAAA  
ACCTAGACGTAATCCATGGGATAGGCATTATGGTTCCACTTGGCAGAAGGCAGACTATTCAACAGC  
CCTATTTACTTACATAGGCTAAAAACTATGTAACAAACTAATGGTATTTAATTGGTTATTGA  
ATTAAAGAGATTGGTATTAGTTTCATAGCTGAGTCCATTCTAATAATTCTGATCTTAGTGGCTAC  
TTAATTAGACATTGGAGCTGCTGAAGAACATGCACTTATGAATTAAAAACTGAATTGCCTGACCT  
CGTTATCACATGAGCTTATTTGGGAAACACATAGAACACTGATGGAGGCTTCTAAGGCCAAGGATAA  
TGTACTAGTGTAAAATGAAATAAAAGTGAAGTGGTAAAT

Human SPG20 protein sequence - var1 (public gi: 28436885) (SEQ ID NO: 386)  
MEQEPQNGEPAEIKIIREAYKKAFLFVNKGNTDELQKKEAKNYYKQGIGHLLRGISISSKESHTGTG  
WESARQMQQKMKTQLQNVTRLEILEKGLATSLQNDLQEVPKLYPEFPDKMCEKLPEPQSAPQHAE  
VNGNTSTPSAGAVAAPASLSPSQCSCAPEAPPAYTPQAAEGHYTVSYGTDSEFSSVGEEFYRNHSQPPP  
LETLGDADELILIPNGVQIFFVNPAGEVSAPSYPGYLIRIVRFLDNLSDTTLNRRPGFLQVCDWLPLVP  
DRSPVLKCTAGAYMFPTDMLQAAGCFVGVLSSLEPEDDRELFPEDLLRQMSDLRLQANWNRAEEENEFOI  
PGRTRPSSDQLKEASGTDVKQLDQGNKDVHKGRKGRAKDTSEEVNLSHIVPCPVEEKPKELHEWS  
EKVAHNILSGASWVSWGLVKGAEITGKAIQKGASKLKERIQPEEKPVESPATKGLYIAKQATGGAAKV  
SQFLVDGVCTVANCVGKELAPHVKKHGSKLVPESLKKDKDGKSPLDGAMVVAASSVQGFSTVWQGLECAA  
KCIVNNVSAETVQTVRKYGYNAGEATHHAVDSAVNVGVTAYNINNIGIKAMVKTATQTGHTLLEDYQI  
VDNSQRENQEGAANVNRGEKDEQTKEVKEAKKKDK

Human SPG20 protein sequence - var2 (public gi: 22074832) (SEQ ID NO: 387)  
MEQEPQNGEPAEIKIIREAYKKAFLFVNKGNTDELQKKEAKNYYKQGIGHLLRGISISSKESHTGPG  
WESARQMQQKMKTQLQNVTRLEILEKGLATSLQNDLQEVPKLYPEFPDKMCEKLPEPQSAPQHAE  
VNGNTSTPSAGAVAAPASLSPSQCSCAPEAPPAYTPQAAEGHYTVSYGTDSEFSSVGEEFYRNHSQPPP  
LETLGDADELILIPNGVQIFFVNPAGEVSAPSYPGYLIRIVRFLDNLSDTTLNRRPGFLQVCDWLPLVP  
DRSPVLKCTAGAYMFPTDMLQAAGCFVGVLSSLEPEDDRELFPEDLLRQMSDLRLQANWNRAEEENEFOI  
PGRTRPSSDQLKEASGTDVKQLDQGNKDVHKGRKGRAKDTSEEVNLSHIVPCPVEEKPKELPEWS  
EKVAHNILSGASWVSWGLVKGAEITGKAIQKGASKLKERIQPEEKPVESPATKGLYIAKQATGGAAKV  
SQFLVDGVCTVANCVGKELAPHVKKHGSKLVPESLKKDKDGKSPLDGAMVVAASSVQGFSTVWQGLECAA  
KCIVNNVSAETVQTVRKYGYNAGEATHHAVDSAVNVGVTAYNINNIGIKAMVKTATQTGHTLLEDYQI  
VDNSQRENQEGAANVNRGEKDEQTKEVKEAKKKDK

Human SPG20 protein sequence - var3 (public gi: 3043744) (SEQ ID NO: 388)  
RPRRELSQRRGARGLEGAEIMEQEPQNGEPAEIKIIREAYKKAFLFVNKGNTDELQKKEAKNYYKQGI  
GHLLRGISISSKESHTGPGWESARQMQQKMKTQLQNVTRLEILEKGLATSLQNDLQEVPKLYPEFPDK  
DMCEKLPEPQSAPQHAEVNGNTSTPSAGAVAAPASLSPSQCSCAPEAPPAYTPQAAEGHYTVSYGTD  
SEFSSVGEEFYRNHSQPPPLETELGDADELILIPNGVQIFFVNPAGEVSAPSYPGYLIRIVRFLDNLSDT  
VLRPPGFLQVCDWLPLVDRSPVLKCTAGAYMFPTDMLQAAGCFVGVLSSLEPEDDRELFPEDLLRQ  
MSDLRLQANWNRAEEENEFOIPIGRTRPSSDQLKEASGTDVKQLDQGNKDVHKGRKGRAKDTSEEVNLS  
HIVPCPVEEKPKELPEWESEKVAHNILSGASWVSWGLVKGAEITGKAIQKGASKLKERIQPEEKPV  
ESPATKGLYIAKQATGGAAKVSQFLVDGVCTVANCVGKELAPHVKKHGSKLVPESLKKDKDGKSPLDGAMV  
VAASSVQGFSTVWQGLECAAKCIVNNVSAETVQTVRKYGYNAGEATHHAVDSAVNVGVTAYNINNIGIK  
AMVKTATQTGHTLLEDYQIVDNSQRENQEGAANVNRGEKDEQTKEVKEAKKKDK

Unigene Name: WASF1 Unigene ID: Hs.75850

Human WASF1 mRNA sequence - var1 (public gi: 4507912) (SEQ ID NO: 375)  
CTCTCTTGCACTTGCGGATGATGAACTGGAATAACGATGAAAGAAAGCACATCCGATCTAACATTAC  
GTCTCTGCCCTATAACGATTAATTAAATTGATCCCCAGCTAGACTAGTGTGAGAAATCAGCATGTTAAA  
ACAACGTGTGATGATAGCTGGAGAAAAGTTCAGTGGAGCTATGGCTGAAAATCGTAAATCTT  
CAAGGTGAACCTGGCACAAAGGTTAACATCTAACGATGCCCTAGTGAACACTGGATGTGTAACCAATT  
GTGCCACACAGCACTGCCCTAGAGGCTTAAGAATGAACTGGAATGTGTAACCAATTTCCTGGCAAAT  
ATAATTAGACAACAAAGTGTGCTAACCTGCAAGAACGATGTTGAGCTTATCTGTTAGTGTACACAGCT  
ATAGTTTCTTCAGAGCTAACCTGCAAGAACGATGTTGAGCTTATCTGTTAGTGTACACAGCT  
TGATCCAAGGAAGAAGAATTGTCTTGCAAGATATAACAATGAGGAAGCTTCCGAAGTTCTACAATT  
CAAGACCAGCAGCTTCGATCGAACAGCTTGCCTATTCCATTACAGGAGACGTACGATGTTGTGAAAC  
AGCCTCCACCTCTCAATATACTCACTCCTTATAGAGATGATGGTAAAGAAGGTCTGAAGTTTATACCAA  
TCCCTCGTATTCTTGATCTATGGAAAGAAAAATGTTGCAAGATACAGAGGATAAGAGGAAGGAAAAG  
AGGAAGCAGAAGCAGAAAAATCTAGATCGTCCTCATGAACCCAGAAAAAGTGCACCTCATGACA  
GGCGGCGAGAATGGCAGAAGCTGGCCCAAGGTCAAGAGCTGGCTGAAGATGATGCTAATCTTACATAA  
GCATATTGAAGTGTCAATGGCCCAGCCTCTCATTTGAAACAAGACCTCAGACATACGTGGATCATATG

GATGGATCTTACTCACTTTCTGCCCTGCCATTAGTCAGATGAGTGAGCTCTGACTAGAGCTGAGGAAA  
GGGTATTAGTCAGACCATGAAACCACCTCCACCTCCACCAATGCATGGAGCAGGAGATGCAAAACCGAT  
ACCCACCTGTATCAGTTCTGCTACAGGTTGATAGAAAATGCCCTCAGTCACCAGCTACAGGAGAACAA  
CCTGTGTTGTGAGCCCCACTCCCCACCTCCACCCACCTCTCCATCTGCCCTGTCAACTTCCAT  
TAAGAGCTTCATGACTCAACTCCCTCCCCCTCCAGTACCTCCCCCACCTCCACCTCCAGGCCACTGCTT  
GCAAGCTCCAGCAGTACCAACCCACCTCCAGCTCTCTTAGATTGCCCTGGAGTTCTCACCCAGCTCC  
CCTCCAATTGCACCTCCCTAGTACAGCCCTCTCCACCAAGTAGCTAGAGCTGCCAGTATGTGAGACTG  
TACCAAGTTCATCCACTCCCACAAGGTGAAGTTCAGGGCTGCCCTCACCCACCCACCGCCTCTGCC  
TCCACCTGGCATTGCCACCATCATCACCTGTACAGTTACAGCTCTGCTCATCTCCCTCTGGCTACAT  
CCAACCTCCATCTACTGCCAGGCTCCCATGTTCCATAATGCCCTCATCTCTCCATCACAAAGTTATAC  
CTGCTCTGAGCCAAAGGCCATCCCATCACCCCTACCTGTAATCAGTGTGAGCTGCCAGGAGTGTGACTGGA  
AGCAATAAGAAAAGTATTCACTACGCAAAAGTAGAAGAGCAGCGTGAACAGGAAGCTAAGCATGAAAGC  
ATTGAAAACGATGTTGCCACCATCCTGCTCGCCGTATTGCTGTAATATAGTATTGGAAAGATGATT  
CAGAAATTGATGAAAGTAGATTGGTTGGAGTAAGAAAATGCTGATTGATTAATGCTTCCAT  
ATGTCCTTGTGGTGTGTTCTTGAAATCTGATTGCTTGTGATTCTAGTGTGTTGCTTCTTCCATTAA  
TAAATGACCCCTTCTCTCCATAAACTTTTGATTCTAAGAAAATATTAGCATACATTCAAACAAATGTT  
TTTACAGTGGCTTATCTTTTCTCCCCCTGAAAAGACTAATTGGTCAAATAAAACCAACTAAGTATTAG  
CATGGACAGCTGTTGTTAGAGTAGCAGATTCACTGGTATATCTTAAATTGTGTAATTGTGAAATT  
TAATTTAAAGAAAGCAACTGAAATTGAAATCTTGAGGGCAGCTGTATCTACTAATGAGCCTTATTCCATT  
TCCTGATGTTTAAAGAAGAAACACTGCCTGATTATAGAATACACTCAGAAAGTACATTAGCTGT  
AGTGTGAATTCTTAAAGGAATGCTGAAATTTCATTATTGTTTATTGTTTATATACTTGCCT  
TATTGAAATGTTAGCAGTATCCCTCCCACTTATATATTGTGTAATTGTTGCTGCCATAGGA  
GTTAAAAAACTTTCCATGTGAAATACTCTGACTTAAACATACATGTAACCTACATAACTGTTAAGAATAA  
CAGTCTGATTAAATAATGGTCATTAAAAGTT

Human WASF1 mRNA sequence - var2 (public gi: 4927209) (SEQ ID NO: 376)  
ATGCCGCTAGTGAAGAACATCGATCCTAGGCACCTGTGCCACACAGCACTGCCTAGAGGCATTAAGA  
ATGAACTGGAATGTGTAACCAATTTCCTGGCAAATAATTAGACAACACTAAGTAGCCCTAAGTAAATA  
TGCTGAAGATATAATTGGAGAAATTCTAACATGAAGCACATAGTTTCTCTAGAGTCACACTCATGCAA  
GAACGTGGAACCGTTATCTGTTAGTGTACACAGCTTGATCCAAGGAAGAAGAATTGCTTTGCAAG  
ATAAACAAATGAGGAAAGCTTCCGAAGTCTACAATTCAAGACAGCAGCAGCTTCGATCGCAAGACTTT  
GCCTATTCCATTACAGGAGACGTACGATGTTGTGAAACAGCCTCACCTCTCAATATAACTCACTCCTTAT  
AGAGATGATGGTAAAGAAGGTCTGAAGTTTATACCAATCCTCGTATTCTTGTATGATCATGGAAAGAAA  
AAATGTTGAAAGATAACAGAGGATAAGAGGAAGGAAAAGAGGAAGCAGAAGCAGAAAAATCTAGATCGCC  
TCATGAACCAGAAAAAGTCCAAGAGCACCTCATGACAGGGGGAGAATGCCAGAAGCTGCCAAGGT  
CCAGAGCTGGCTGAAGATGATGCTAACTCTTACATAAGCATATTGAGTTGTAATGGCCCAGCCTCTC  
ATTTGAAACAAGACCTCAGACATACTGGATGATGGATCTTACTCACTTTCTGCCCTGCCATT  
TAGTCAGATGAGTGAACGTTCTGACTAGAGCTGAGGAAGGGTATTAGTCAGACCATGAAACCCACTCCA  
CCTCCACCAATGCATGGAGCAGGAGATGCAAACCGATAACCCACCTGTATCAGTTCTGCTACAGGTTG  
TAGAAAATGCCCTCAGTCACCCAGCTACAGGAGAACACCTGTGTTGTGAGCCCCACTCCCCCACCTCC  
TCCACCACTCTTCCATCTGCCCTGTCAACTCCCTCATTAAGAGCTTCAATGACTTCAACTCCTCCCCCT  
CCAGTACCTCCCCCACCTCCACCTCAGGCACTGCTTGCAGGCTTCAAGCTCCAGCAGTACCCACCTCCAGCTC  
CTCTTCAGATGCCCTGGAGTTCTTCAACCGAGCTCCCTCTCCATTGACCTCTAGTACAGCCCTC  
TCCACCACTAGCTAGAGCTGCCAGTATGAGACTGTCAGGCTCATCCACTCCACAAAGGTGAAGTT  
CAGGGGGTGCCTCCACCCCCACCGCTCCATGCCCTCCACCTGGCATTGACCCATCATCACCTGTCA  
CAGTTACAGCTCTGGCTCATCCCTCTGGGCTACATCCAACCTCATCTACTGCCCAAGGTCCCCATGT  
TCCATTAAATGCCCTCATCTCCATCACAAGTTACCTGCTTCTGAGCCAAAGGCCATCCATCAACC  
CTACCTGTAATCAGTGATGCCAGGAGTGTGCTACTGGAGCAATACGAAAAGGTATTAGCTACGCAAAG  
TAGAAGAGCAGCTGAACAGGAAGCTAACGATGAAACCCATTGAAAACGATGTTGCCACCATCCTGTCTCG  
CCGTATTGCTGTTGAATATAGTGATTGGAAAGATGATTGAGAATTGATGAAAGTAGATTGGTTGGAGTAA  
AAAAATGCAATTGATAAAATATTACAAAACGAAATGCAAATGCTCTTGTGGTCTTGTGAAAGATG  
TTGGTCA

Human WASF1 protein sequence - var1 (public gi: 4507913) (SEQ ID NO: 389)  
MPLVKRNIDPRHLCTHALPRGIKNELECVTNISLANIIRQLSSLSKYAEDIFGELFNEAHFSFRVNSLQ  
ERVDRLSLSVTQLDPKEEELSLODITMRKAFRSSTIQQQLFDRTKLPIPLQETYDVCEQPPLNLTPY  
RDDGKEGLKFYTNPSYFFDLWKEKMLQDTEDKRKEKRQKQKNLDRPHEPEKVPRAPHDRREWQKLAQG  
PELAEDDANLLHKHIEVANGPASHFETRPQTVDHMDGSYSLSALPFSQMSELLTRAEEFVLVRPHEPPP  
PPPMHGAGDAKPPIPTCISSATGLIENRQSPATGRTPVFVSPTPPPPPPLPSALSTSSLRASMTSTPPP  
PVPPPPPPPPATALQAPAVPPPPAPLQIAPGVLKHPAPPPIAPPLVQSPSPVVARAAPVCETVPVHPLPQGEV  
QGLPPPPPPPPPLPPPGIRSPSVTALAHPPSGLHPPTSTAPGPHVPLMPPSPSQVIPASEPKRHPSLT  
LPVISDARSVILLEAKGIGLRKVEEQREAKEHRIENDVATILSRRIAVEYSDSEDDSFDEVDWLE

Unigene Name: HIP-55 Unigene ID: Hs.183373

Human HIP-55 mRNA sequence - var1 (public gi: 6470260) (SEQ ID NO: 377)

ATGGCGCGAACCTGAGCCGAACGGGCCAGCGTCAAGAGGCCTACGTGCGGGTGGTCACCGAGAAGT  
CCCGAACGACTGGGCTCTCTTACCTATGAAGGCAACAGCAATGACATCCCGTGGCTGGCACAGGGGA  
GGGTGGCCTGGAGGAGATGGTGAGGAGCTAACAGCGGGAAAGGTGATGTACGCCTCTGCAGAGTGAAG  
GACCCAACACTGGACTGCCAAATTGTCCTCATCAACTGGACAGGCCAGGGCGTGAACGATGTGCGGA  
AGGGAGCCTGTGCCAGCACGTCAAGCACCAGGCCAGCTTCTGAAGGGGGCCCATGTGACCATCAACGC  
ACGGGCCGAGGAGGATGTGGAGGCTGAGTGCATGGAGAAGGTGGCCAAGGCTTCAGGTGCGCAACTAC  
AGCTTTACAAGGAGAGTGGCGCTTCCAGGACGTGGGACCCCAGGCCCCAGTGGCTCTGTGACCCAGA  
AGACCAATGCGTGTCTGAGATAAAGGGTTGGTAAAGACAGCTCTGGGCAAAGCAGAGAAGGGAGGA  
GGAGAACCGTGGCGAGGAGGAAAGGGGGGGCGAGGCCAGGCCAGTGGAGCAGGCCAGGGCG  
GAGCGTGGCTGGCGAGGAGCAGCAAGAAGTGGTTCAAGGAACCGAAATGAGCAGGAGTCTGCCGTGCA  
AGAGGACGTGGAGCAGCAAGAAGTGGCTTCAAGGAACCGAAATGAGCAGGAGTCTGCCGTGCA  
GAGGGAGATTTCAAGCAGAAGGAGGGCCATGTCCACCAACCTCCATCTCCAGTCCAGGCCAGGG  
CTGAGGAGCCCTTCTGAGAGCAGCTACCCAAACAGAGACCCACTTGGCAGAGAGGCCAGCTGCTG  
CCATCTCAAGGCCAGGGCAGATCTCCCTGCTGAGGAGCCGCCAGCACTCCCATGTCGGTGC  
GGCAGAAGAGGAGGCTGTGTATGAGGAACCTCCAGAGCAGGAGACCTTACGAGCAGGCCACTGGT  
CAGCAGCAAGGTGCCGGCTGTAGCACATTGACCACACATTAGGGCCAGGGGCTCAGTGGGCAAGGG  
TCTGTGCCGTGCCCTGTACGACTACCAGGAGCCAGCACAGAGATCTCCATTGACCCGAGAACCT  
CATCACGGCATGAGGTGATGACCAAGGCTGGCTGGCTATGGCCGGATGGCATTITGGCATG  
TTCCTGCCACTACGTGGAGCTATTGAGTGGCTGAGGCCAGGGCTAGACTAGTCTAGAGAAAAAA  
C

Human HIP-55 mRNA sequence - var2 (public gi: 8885629) (SEQ ID NO: 378)

GAAGCTACAGCAGCGCGGGAGACTGGGGGGGCCATGGCGCGAACCTGAGCCGAACGGGCCAGC  
GCTGCAAGAGGCCAACCTACGTGGGGTGGTACCGAGAAGTCCCCGACCGACTGGGCTCTCTTACCTATGAA  
GGCAACAGCAATGACATCCCGTGGCTGGCACAGGGGAGGGTGGCTGGAGGAGATGGTGGAGGAGCTCA  
ACAGCGGGAAAGGTGATGTACGCCTCTGCAAGAGTAAGGACCCCAACTCTGACTGCCAAATTGCT  
CATCAACTGGACAGCGAGGGCTGAACGATGTGGAGAAGGGAGGCTGTGCCAGCCACGTCA  
GCCAGCTTCTGAAGGGGCCATGTGACCATCAAGCAGCGGGCCAGAGGAGGATGTGGAGGCTGAGTGC  
TCATGGAGAAGGTGGCAAGGCTTCAGGTGCCAACTACAGCTTACAAGGAGAGTGGCCGCTTCCAGGA  
CGTGGGACCCAGGCCAGTGGCTCTGTGTACAGAACGACATGCCGTGTCAGATTAAAAGGGTT  
GGTAAAGACAGCTTCTGGCCAAGCAGAGAAGGAGGAGGAGAACCGTGGCTGGAGGAAAGCGCGGG  
CCGAGGAGGCACAGCGGAGCTGGAGCAGGAGCGCCGGAGCGTGGAGGCTGAGGCTGACGCCGG  
GCAGCGTATCAGGAGCAGGGTGGCGAGGCCAGCCCCAGAGGAGCTGGAGCAGCAAGAAGTGGTT  
TCAAGGAACCGAAATGAGCAGGAGTCTGCCGTGCAACCGAGGGAGATTTCAGCAGAAGGAGGGCCA  
TGTCCACCACCTCCATCTCCAGCTGCCAGCTGGCAAGCTGAGGAGGCCCTTCTGAGAACGCTCAC  
CCAACCAGAGACCCACTTGGCAGAGGAGCCAGCTGCTGCCATCTCAAGGCCAGGAGATCTCCCTGCT  
GAGGAGCGGGCCAGACTCTCCATGTCGGTGCAGGAGAAGGAGGAGCTGTGTATGAGGAACCTC  
CAGAGCAGGAGACCTTCTACGAGCAGCCCCACTGGTGCAGCAGCAAGGTGCTGGCTTGAGCACATTGA  
CCACACATTAGGGCAAGGGCTCAGTGGCAAGGGCTCTGTGCCCTGTACGACTACCAGGA  
GCCGACGACACAGAGATCTCTTGACCCGAGAACCTCATCACGGCATCGAGGTGATGACGAAGGCT  
GGTGGCTGGCTATGGCCGATGGCATTGGCATGTTCCCTGCCAACTACGTTGAGGCTCATTGAGTG  
AGGCTGAGGGCACATCTGCCCTCCCTCTAGACATGGCTTCTATTGCTGAAAGAGGAGGCCCTGG  
AGTTGACATTAGCAGCACTCTCCAGGAATAGGACCCCACTGAGGATGGGCTCAGGGCTCCCTCCGGCT  
TGGCAGACTCAGCCTGTACCCCAATGCAAGCAATGGCCTGGTATTCCCACACATCCCTGCA  
CCGACCCCTCCAGACAGCTGGCTCTGGCCCTGACAGGAACTGAGCCAAGGCCCTGCTGGCCAAGC  
CCTGAGTGGCAACTGCCAAGCTGCGGGAGGGCTGTGAGCAGGGGATCTGGGAGGCTCTGGCTGCC  
CTGCAATTATTGCTCTTTCTCTTCTGCTTCTAAGGGGTTGGCCACCAACTGTTAGAC  
CCTGGGAACAGTGAACCTAGAGAAATTGTTAGCAGAGTTGTGACCAAAGTCAGAGTGGATCATGG  
GGTTGGCAGGGAAATTGCTTGTGAGGAGCTGTGCTCTGCTGCCACCTCCATTCTGTCCCT  
GCCCTGGCTATGGGAAGTGGGAGTGCAGATGCCAGCTCCACCCCTGGTATTCAAAACGGCAGACAC  
AACATGTTCTCCACGCCGCTAAAAAAAAAAAAAA

Human HIP-55 mRNA sequence - var3 (public gi: 8917572) (SEQ ID NO: 379)

ATGGCGCGAACCTGAGCCGAACGGGCCAGCGTCAAGAGGCCTACGTGCGGGTGGTCACCGAGAAGT  
CCCGAACGACTGGGCTCTCTTACCTATGAAGGCAACAGCAATGACATCCCGTGGCTGGCACAGGGGA  
GGGTGGCCTGGAGGAGATGGTGAGGAGCTAACAGCGGGAAAGGTGATGTACGCCTCTGCAGAGTGAAG  
GACCCAACACTGGACTGCCAAATTGTTCTCATCAACTGGACAGGCCAGGGCTGAACGATGTGCGGA

AGGGAGCCTGTTCCAGCCACGTCAAGCACCATGGCCAGCTTCTGAAGGGGCCATGTGACCATAACGC  
ACGGCGGAGGAGGATGTGGAGCCTGAGTCATCATGGAGAAGGTGGCAAGGCTTCAGGTGCCAACTAC  
AGCTTCACAAGGAGAGTGGCGCTTCAGGACGTGGGACCCAGGCCAGTGGCTCTGTGTACCGA  
AGACAAATGCCGTGTCAGATTAAAGGGTTGGAAAGACAGCTTCTGGCCAAGCAGAGAACGGAGGA  
GGAGAACCGTCCCCTGGAGAAAAGCGCGGGCCAGGAGGACAGCGCAGCTGGAGCAGGAGCGCCGG  
GAGCGTGAAGCTCGTGAGGCTGACGCCGGAGCAGCGTACAGGAGCAGGGTGGCGAGGCCAGCCCC  
AGAGTACGTGGGAGCAGCAAGAAGTGGTTCAAGGAACCGAAATGAGCAGGAGTCTGCCGTGACCC  
GAGGGAGATTTCAAGCAGAAGGAGAGGGCATGTCACCCACTCTCCAGTCAGCTCAGCTGGCAAG  
CTGAGGAGCCCCCTCTGAGAAGCAGCTCAGGAAACCCAGAGAACCCACTTGGCAGAGAGGCCAGCTG  
CCATCTCAAGGCCAGGGAGATCTCCCTGCTGAGGAGCAGCTCAGGAGCAGGCCAGTGGCT  
GGCAGAAGAGGAGGCTGTGATGAGGAACCTCCAGCAGGAGCAGCCAGTGGCAGAGGCCAGTGGT  
CAGCAGAAGGTGCTGGCTGAGCACATTGACCAACATTCAAGGCCAGGGCTAGTGGCAAGGGC  
CTGTGCCCCGTGCCCCGTACGACTACCAGGCAGCGACAGAGATCTCTTGACCCGAGAACCT  
CATCACGGGATCGAGGTGATCGACGAAGGCTGGCGTGGCTATGGGCCGATGGCATTGGCATG  
TTCCCTGCCAACTACGTGGAGCTATTGAGTGA

Human HIP-55 mRNA sequence - var4 (public gi: 10121214) (SEQ ID NO: 380)  
GGGGGGCCATGGCGCGAACCTGAGCCGGAACGGGCCAGCGCTGCAAGAGGCCACGTGCGGGTGGTC  
ACCGAGAAGTCCCCGACCGACTGGGCTCTTACCTATGAAGGCAACAGCAATGACATCCGCGTGGCTG  
GCACAGGGGAGGGTGGCTGGAGGAGATGGTGGAGGAGCTAACAGCGGGAGGTGATGTACGCCCTCTG  
CAGAGTGAAGGACCCAACTCTGACTGCCAAATTGTTCTCATCAACTGGACAGGCCAGGGCGTGAAC  
GATGTGCGGAAGGGAGGCTGTTCCAGGCACGTCAACGACCATGGCAGCTCCATGTGAAGGGGCCATGTGA  
CCATCAACGCACGGGCCAGGGAGGATGTGGAGCCTGAGTGCATCATGGAGAAGGTGGCCAAGGCTTCAGG  
TGCCAACCTACAGCTTCAACAGAGGAGTGGCCGCTTCCAGGAGCTGGGACCCAGGGCCAGTGGCT  
GTGTACCAAGAACCAATGCCGTGTCAGATTAAAGGGTTGGTAAGAGACAGCTTCTGGCCAAGGAG  
AGAAGGAGGAGGAGAACCGCTGGTGAGGAAAAAGCGCGGGCCAGGAGGCCAGCGCAGCTGGAGCA  
GGAGCGGGGGAGCGTGAAGCTGGCTGAGGCTGCAAGCGGGAGCAGCGCTATCAGGAGCAGGGTGGCGAG  
GCCAGCCCCAGAGTACGTGGAGCAGCAAGGAACTTCAAGGAGGAGTGGCCACATTGACCCACATTCA  
CCGTGACCCCGAGGGAGATTTCAGCAGAGGAGGGCCATGTCACCCACTCTCCAGTCCTCA  
GCCTGGCAAGCTGAGGAGGCCCTTCTGCAAGCAGCTACCCAAACAGAGAACCCACTTGGCAGAG  
CCAGCTGCTGCCATCTCAAGGCCAGGGAGATCTCCCTGCTGAGGAGGCCGCCAGCACTCCCAT  
GTCTGGTGCAGGAGAAGAGGAGGCTGTGATGAGGAACCTCCAGAGCAGGAGACCTTCAAGGAGCAGCC  
CCCAGTGGTGCAGCAGCAAGGTGCTGGCTCTGAGCACATTGACCCACATTCAAGGGCCAGTGGCT  
GGGCAAGGGCTCTGTGCCGTGCCCTGACCACTTACAGGAGCAGGCCACAGAGATCTCTTGACC  
CCGAGAACCTCATCACGGCATCGAGGTGATCGACGAAGGCTGGCTGGCTATGGGCCGATGGCA  
TTTGGCATTTCTGCCAACTACGTGGAGCTATTGAGTGAAGGAGGCCAGGGCTGGAGTTGACATT  
TCTCAGACATGGCTCTTATTGCTGGAAGAGGAGGCCAGGGCTGGAGTTGACATTCAAGCACTCTCAGGAAT  
AGGACCCCCAGTGGAGGATCTGGCTCAGGGCTCCCTCCGGCTTGGCAGACTCAGCTGTCA  
CAGCAATGGCTGGTATCCCACACATCCCTCTGCACTCCCCGACCCCTCCAGACAGCTTGCTCTG  
CCCCCTGAGAGATACTGAGCCAAGCCCTGCCGTGGCCAAGCCCTGAGTGGCCACTGCCAAGCTGCC  
AAGGGTCTGAGCAGGGGCATCTGGGAGGCTGGCTGCCATTCTGCATTATTGCTTTCTTT  
TCTGCTCTAAGGGGTGGTGGCCACCACTGTTAGAATGACCCCTGGAAACAGTGAACGTTAGAGAATTG  
TTTTAGCAGAGTTGTGACCAAAGTCAGAGTGGATCATGGTGGTTGGCAGCAGGAATTGCTTGT  
GGAGCCTGCTCTGTGCTCCCCACTCCATTCTCTGCTGCCCTGGCTATGGGAAGTGGGGATGCAG  
ATGGCCAAGCTCCCACCTGGTATTCAAAAACGGCAGACACAACATGTTCTCCACGCCGCTCGCTGA  
TGCCCTGCCAGGGCCAGTGTGCTCAACTGATCTGACTTCAGGAAAAGTAACACAGAGTGGCTTGG  
CTGTTGTCTTCCCTATTCTGCTGCCAGTCATCCGTGTCAGAAGAATAATGCTTTGGAAAAA  
AAAAAAAAAA

Human HIP-55 mRNA sequence - var5 (public gi: 10441969) (SEQ ID NO: 381)  
GACCACATCAACGCACGGGCCAGGGAGGAGATGTGGAGCCTGAGTCATGGAGAAGGTGGCAAGGCTTC  
GGTGCCTACACTACAGCTTCAAAAGGAGAGTGGCCCTCCAGGACGTGGGACCCAGGCCAGTGGCT  
CTGTGACCGAGAACCAATGCCGTGTCAGATTAAAGGGTTGGTAAGACAGCTTCTGGGCCAAAGC  
AGAGAAGGAGGAGGAGAACCGCTGGCTGGAGGAAAAGCGGGCCGGAGGAGGACAGCGCAGCTGGAG  
CAGGAGCGCCGGAGCGTGAAGCTGGCTGAGGCTGACGCCGGAGCAGCGCTATCAGGAGCAGGGTGGCG  
AGGCCAGCCCCAAAGGAGCTGGGAGCAGCAAGAAGTGGTTCAAGGAACCGAAATGAGCAGGAGTC  
TGCCGTGACCCAGGGAGATTTCAGCAGAAGGAGAGGCCATGTCACCCACCTCCATCTCCAGTCCT  
CAGCCTGGCAAGCTGAGGCCCTTCCCTGCAAGCAGCTACCCAAACAGAGACCCACTTGGCAGAG  
AGCCAGCTGCTGCCATCTCAAGGCCAGGGCAGATCTCCCTGCTGAGGAGGCCAGCAGCTCC  
ATGTCTGGTGCAGGAGAACAGAGGAGGCTGTGATGAGGAACCTCCAGAGCAGGAGACCTTCTACGAGCAG  
CCCCCACTGGTGCAGCAGCAAGGTGCTGGCTCTGAGCACATTGACCCACATTCAAGGCCAGGGCTCA  
GTGGGCAAGGGCTCTGTGCCGTGCCCTGTACGACTACCAGGCAGCCAGCAACAGAGATCTCCTTGA

CCCCGAGAACCTCATCACGGGCATCGAGGTGATCGACGAAGGCTGGTGGCGTGGCTATGGGCCGATGGC  
 CATTGGCATTTCCCTGCCAACTACGTGGAGCTCATTGAGTGAGGCTGAGGGCACATCTGCCCTTC  
 CCTCAGACATGGCTTCCCTATTGCTGGAAGAGGAGGGCTGGGAGTTGACATTGACACTCTCCAGGA  
 ATAGGACCCCACTGGAGGATGAGGCCTCAGGGCTCCCTCGGCTGGCAGACTCAGCCGTGACCCAAA  
 TGCAGCAATGGCCTGGTATTCCCACACATCTTCCCTGCATCCCCGACCCCTCCCAGACAGCTGGCTCT  
 TGCCCTGACAGGATACTGAGCCAGGGCTGAGGCTCTGCTGCTTCTGCTTATTGCTTTTCTTT  
 GGAAGGGCTCTGAGCAGGGCATCTGGGAGGCTGGCTGCCCTTGAGGAACTGAGCTGAACTGAGAAT  
 TCTTGTCTTAAGGGTGGCACCCTGTTAGAATGACCCCTGGGAAACAGTGAACGTAGAGAAT  
 TGTGAGGTTAGCAGAGTTGTGACCAAAGTCAGAGTGGATCATGGTGGTTGGCAGCAGGGAAATTGTCTT  
 TTGAGGCTGCTGTGCTCCCCACTCCATTCTGTCCCTGCCTGGCTATGGGAAAGTGGGATGC  
 AGATGGCCAAGCTCCCACCCCTGGTATTCAAAAACGGCAGACACAACATGTCCTCACGCCGCTCACTC  
 GATGCCCTGCAGCCCCAGTGTGCTCAACTGATTCTGACTCAGGAAAAGTAACACAGAGTGGCCTT  
 GCCTGTTGTCTCCCCATTCTGTCCAGCTATCCGTGCTCTGAGAACAAATATGCTTTGGACC  
 ACGAAAAAAAAAAAAAA

Human HIP-55 mRNA sequence - var6 (public gi: 14041995) (SEQ ID NO: 382)  
 AGCGGCGGGAGACTCGGGGGCGGCGATGGCGGCGAACCTGAGCCGGAACGGGCCAGCGCTGCAAGAGG  
 CCTACGTGCGGGTGGTACCGAGAAGTCCCCGACCGACTGGCTCTTACCTATGAAGGCAACAGCAA  
 TGACATCCCGTGGCTGGCACAGGGGAGGGTGGGCTGGAGAGATGGTGGAGGAGCTAACAGGGGAAG  
 GTGATGTACGCTTCTGCAAGGTGAGAGTGAAGGACCCAACTCTGGACTGCCAACATGGCTCATCAACTGGA  
 CAGGCGAGGGCGTGAACGATGTGCGGAAGGGAGGGAGCTGTGCCAGCACGTGACCATGGCAGCTTCT  
 GAAGGGGGCCATGTGACCAACTACAGCTTCAACAAGGAGAGTGGCCGTTCCAGGACGTGGGACCC  
 GTGGCCAAGGGCTTCAAGGTGCAACTACAGCTTCAACAAGGAGAGTGGCCGTTCCAGGACGTGGGACCC  
 AGGGCCCAGTGGCTCTGTGTACCAAGAGACCAATGCCGTGCTGAGATTTAAAGGGTGGTAAAGACAG  
 CTCTGGGCAAGCAGAGAAGGAGGGAGAACCGTGGCTGGAGGAAAAGCGGGGGCGAGGAGGCA  
 CAGGGCAGCTGGAGCAGGAGCGCCGGGAGCGTGGAGCTGCGTGGAGGCTGCAAGCCGGAGCAGCGTATC  
 AGAGCAGGGTGGCAGGGCAGCCCCAGAGCAGGACGTGGAGCAGCAGCAAGAAGTGGTTCAAGGAA  
 CCGAAATGACCAAGGGTCAACATGTGCTTCCCTCAGGAGTCTGCCGTGCAACCGAGGGAGATTTCAG  
 CAGAAGGAGAGGGCATGTGCCACCACCTCCATCTCAGGCTGGCAAGGCTGAGGAGGCCCTTCC  
 TGCAGAAGCAGCTCACCAACCAGAGACCCACTTGGCAGAGAGGCCAGCTGCTGCCATCTCAAGGCCCAG  
 GGCAGATCTCTGTGAGGAGCGGGCGCCAGCACTCTCATGTCTGGTGCAGGCAGAAGAGGAGGCT  
 GTGATGAGGAACCTTCAAGGAGGGAGACCTTCAAGGAGCAGGAGACCTTCAAGGAGCAGGAGCTG  
 GCTCTGAGCACATTGACCAACATCCAGGGCAGGGCTCAGTGGCAAGGGCTCTGTGCCCCGTGCCCT  
 GTGACTACAGGCGACGACACAGAGATCTCTTCAACCCGAGAACCTCATCACGGCATCGAG  
 GTGATCGACGAAGGCTGGTGGCTGCTATGGGGCGATGCCATTGGCATGTCCTGCCAACTACG  
 TGGAGCTCATGTGAGTGGCTGAGGCACATCTGCCCTTCCCTCTCAGACATGGCTTCTTATTGCTG  
 GAAGAGGAGGGCTGGAGGTTGACATTGACACTCTCCAGGAATAGGACCCCCAGTGGAGGATGAGGCTC  
 AGGGCTCCCTGGCTGGCAGACTCAGCCTGTACCCCCAATGCAAGCAATGCCCTGGTGAATTCCCACAC  
 ATCCTTCTGCACTCCCCGACCCCTCCCAGACAGCTGGCTTGTGCCCTGACAGGAACTGAGCCAAGCC  
 CTGCCGTGGCAAGCCCTGACTGCCAGTGCCAGCTGCCAGGGGAAGGGCTCTGAGCAGGGCATCTGGG  
 AGGCTCTGGCTGCCCTGTGATTTCCTTCTCTGCTTCTAAGGGTGGTGGCCAC  
 CACTGTTAGAATGACCCCTGGGAACAGTGAACGTAGAGAATTGTTTAGCAGAGTTGTGACCAAAGT  
 CAGAGTGGATCATGGTGGTTGGCAGAGGAATTGTCTTGTGGAGGCTGTGCTCCCCACTCC  
 ATTCTCTGTCTTCTGCTGGCTATGGGAAGGGATGCAAGATGCCAAGCTCCCACCTGGTATT  
 CAAAACGGCAGACACAAATGTTCTCCACGCCGCTACTCGATGCCGTGAGGCCAGTGTGCTGCTC  
 AACCGATTCTGACTTCAGGAAAAGTAACACAGAGTGGC

Human HIP-55 mRNA sequence - var7 (public gi: 15079722) (SEQ ID NO: 383)  
 GGCAAGGGGGGGAGACTCGGGGGGGCATGGCGGGAACCTGAGCCGGAACGGGCCAGCGCTGCAAG  
 AGGCCTACGTGCGGGTGGTACCGAGAAGTCCCCGACCGACTGGCTCTTACCTATGAAGGCAACAG  
 CAATGACATCCCGTGGTGGCACAGGGGAGGGTGGCTGGAGGAGATGGTGGAGGAGCTAACAGCGGG  
 AAGGTGATGTACGCTTCTGCAAGGTGAGAGTGAAGGACCCAACTCTGGACTGCCAACATTGTCTCATCAACT  
 GGACAGGCGAGGGCGTGAACGATGTGCGGAAGGGAGGCTGTGCCAGCACGTGACCATGGCAGCTT  
 CCTGAAGGGGGCCATGTGACCATCAACGCAAGGGCGAGGAGGATGTGGAGGCTGAGTCATCATGGAG  
 AAGGTGGCCAAGGGCTCAGGTGCAACTACAGCTTCAAGGAGAGTGGCCGCTTCCAGGACGTGGGAC  
 CCCAGGGCCAGTGGCTCTGTGTACCAAGAGACCAATGCCGTGCTGAGATTAAAGGGTGGTAAAGA  
 CAGCTTCTGGCCAAGAGCAGAGAAGGGAGGGAGAACGTCGGCTGGAGGAAAAGCGGGGGGGAGCAGCGCT  
 GCACAGCGGAGCTGGAGCAGGAGGCCGGAGCGTGAGCTGCCGTGAGGCTGCCAGCAGCAAGTGGTTCAAG  
 ATCAGGAGCAGGGTGGCAGGGCCAGCCCCCAGAGCAGGAGCTGGGGAGATTTCAGCAGAGAGGGCCATGTCC  
 GAACCGAAATGAGCAGGGAGTGTGCTGCCACCCGAGGGAGATTTCAGCAGAGAGAGGGCCATGTCC  
 ACCACCTCCATCTCCAGTCTGCCAGGCTGGCAAGCTGAGGAGCCCCCTTCTGCAAGAAGCAGCTACCCAC  
 CAGAGACCCACTTGGCAGAGGCCAGTGTGCCATCTCAAGGCCAGGGCAGATCTCCCTGCTGAGGA

GGCGGCGCCAGCACTCCTCATGTCGGTGCAGGCAGAAGAGGAGGCTGTATGAGGAACCTCCAGAG  
CAGGAGACCTCTACGAGCAGCCCCACTGGTGCAGCAGCAAGGTCTGCTCTGAGCACATTGACCACC  
ACATTCAGGGCCAGGGCTCAGTGGCAAGGGCTCTGTGCCCTGCCCTGTACGACTACCCAGGCAGCCGA  
CGACACAGAGATCTCTTGCACCCCGAGAACCTCATCAGGGCATCGAGGTATCGACGAAGGCTGGTGG  
CGTGGCTATGGCCGGATGCCATTGGCATGTCCTGCCAACTACGTGGAGCTCATTGAGTGAGGCT  
GAGGCCACATCTGCCCTTCCCCTCATGACATGGCTTCTTATTGCTGGAAGAGGAGGCCCTGGAGTTG  
ACATTCAGCACTTCCAGGAATAGGACCCCCAGTGAGGATGAGGCCTCAGGGCTCCCTCCGGCTTGGCA  
GACTCAGCCTGTCAACCCAAATGCAGCAATGGCTGGTATTCCCACACATCCTCCGTATCCCCGAC  
CCTCCAGACAGCTGGCTCTGCCCTGACAGGATACTGAGCCAAGGCCCTGCCGTGGCCAAGCCCTGA  
GTGCCACTGCCAAGCTGGGGAGGGCTGAGCAGGGCATCTGGAGGCTCTGGCTGCCCTTGCA  
TTTATTGCTTTCTTCTGCTTAAGGGTGGTGGCCACACTGTTAGAAATGACCCCTG  
GGAACAGTGAACGTAGAGAATTGTTTTAGCAGAGTTGTGACCAAAGTCAGAGTGGATCATGGGGTT  
GGCAGCAGGGAAATTGTCTGTTGGAGCCTGCTGTGCTCCCCACTCCATTCTGTCCCTCTGCCCTG  
GGCTATGGGAAGTGGGATGCAGATGCCAAGCTCCACCCCTGGTATTACCAACGGCAGACACAACAT  
GTTCTCCACGCGGCTCACTCGATGCCCTGCAGGGCCCTGAGTGTGCCCTCAACTGATTCTGACTTCAGGAA  
AAGTAACACAGAGTGGCCTGGCCTGTTGCTTCCCCTATTCTGTCCAGCTCATCGTGTCTGAA  
GAACAAATATGTTGGACACGAAAAAAAAAAAAAAA

Human HIP-55 mRNA sequence - var8 (public gi: 21619482) (SEQ ID NO: 384)

CGGGCCATGGCGGCGAACCTGAGCGGAAACGGGCAGCGCTGCAAGAGGCCACGTGCGGGTGGTCACCG  
AGAAGTCCCCGACCGACTGGCTCTCTTACCTATGAAGGAAACAGCAATGACATCCGCGTGGCTGGCAC  
AGGGGAGGGTGGCTGGAGGAGATGGTGGAGGAGCTAACAGCGGGAAAGGTATGTACGCCCTTGCA  
GTGAGGAGACCCAACTCTGACTGCCAAATTGTCTCATCAACTGGACAGGCAGGGCGTGAACGATG  
TGCGGAAGGGAGCCGTGAGCAGCAGCCATGGCAGCTTCTGAAGGGGCCATGTGACCAT  
CAACGCACGGGCCAGGGAGATGTGGAGCCTGAGTGCATCATGGAGAAGGTGGCCAAGGCTTCAGGTGCC  
AACTACAGCTTCAAGGAGAGTGGCGCTTCAGGACGTGGGACCCCAGGCCCCAGTGGCTCTGT  
ACCAAGAGACCAATGCCGTGCTGAGATTAAAGGGTTGGTAAAGACAGCTCTGGCAAAGCAGAGAA  
GGAGGAGGAGAACCGTCGCTGGAGGAAAAGCGCGGGCCGAGGAGGACAGCGGAGCTGGAGCAGGAG  
CGCCGGAGCGTGAAGCTGCGTGAGGCTGCAAGCCGGAGCAGCGCTATCAGGAGCAGGGTGGCGAGGCCA  
GCCCGCAGAGGACGTGGGAGCAGCAGCAAGAAGTGGTCAAGGAACGGAAATGAGCAGGAGTCTGCC  
GCACCCGAGGGAGATTTCAGAGCAGAAGGAGAGGCCCCATGTCACCCACTCCAGTCCAGCCT  
GGCAAGCTGAGGAGCCCCCTCTGCAAGAACGACTCACCAACAGAGACCCACTTGGCAGAGGCCAG  
CTGCTGCCATCTCAAGGCCAGGGCAGATCTCCCTGCTGAGGAGCAGCTCACCTCCATGTCT  
GGTCAGGAGAACAGAGGAGGCTGTGATGAGGAACCTCCAGAGCAGGAGACCTCTACGAGCAGCCCCA  
CTGGTGCAGCAAGGTGCTGGCTGAGCACATTGACCAACACATTAGGGCCAGGGCTCAGTGGG  
AAGGCTCTGCCCCGTGCTGTACGACTACCAAGGAGCCAGACACAGAGATCTCTTGACCCGA  
GAACCTCATCGGGCATCGAGGTGATCGACGAAGGCTGGCTGGCTATGGCCGATGGCATT  
GGCATGTTCCCTGCAACTACGTGGAGCTATTGAGTGGCTGAGGACATCTGCCCTCCCTCTC  
AGACATGGCTTCTTATTGCTGGAAGAGGAGGCTGGAGTTGACATTCACTCAGCTCTTCCAGGAATAGGA  
CCCCCAGTGAAGGATGAGGCCCTAGGGCTCCCTCGGCTTGCAGACTCAGCTGTCAACCCAAATGAGC  
AATGGCTGGTGAACACATCTCTGCACTCCCCGACCCCTCCAGACAGCTTGGCTCTGCC  
TGACAGGATACTGAGCCAAGCCCCCTGGCTGGCCAAGCCCTGAGTGGCACTGCCAAGCTGCGGGAAAG  
GTCCCTGAGCAGGGGATTGGGAGGCCACTGTGTTAGAATGACCCCTGGGAGCTGAACGTTAGAGAATTGTT  
GCTCTAAGGGTGGTGGCACCCTGTTAGAATGACCCCTGGGAGCTGAACGTTAGAGAATTGTT  
TAGCAGAGTTGTGACCAAGTCAGAGTGGATCATGGTGGTTGGCAGCAGGGAAATTGCTTGTGGAG  
CCTGCTCTGCTCCCCACTCCATTCTGTCCCTGCTGGCTGGGAGTGGGATGCAGATGG  
CCAAGCTCCCCCTGGTATTCAAAACGGCAGACACACATGTTCTCCACGCCACTCGATGCC  
TGCAGGCCAGTGTGCTCAACTGATTCTGACTTCAGAAAAGTAACACAGAGTGGCCTGGCCTGT  
TGTCTTCCCCTAAAAAAA

Human HIP-55 mRNA sequence - var9 (public gi: 23959038) (SEQ ID NO: 385)

GGCACGAGGATTGACACATGAATGTATAGCAGTCATTGGAAACTCCACAGCTCATGTTTCTCATAG  
TAGATGTGTGCTCCCATCTCATGGCTTGTCCCTCACACCCCCACCCCATGGTAAGTCAGGCCAGTGT  
CCTCCCAGCTGAGAGCTGAGAAGGCTGCACAGTTGCCACTGAGAACCTGCCAGTGGTCAGAGCAA  
GTGAGAACGGCCTGTGCCACCCACAGTGTACTGTCAAGGCCAGCTTGGGATGTAGTGGAAAGTC  
ATGGTGGATAAGGTGAGGAGAGATGGAACCCAAGGTGCTGGCTACAGAGCTACTTGTGTTCTTGT  
GGCTCTCTTACCTATGAAGGCAACAGCAATGACATCCGCGTGGCTGGCACAGGGGGTGA  
AAATGGACTCAGGGACACCCAGGGAGGTAGGAGGGTGAACGACAGGGGTCA  
CACTGAGGCCACATGGGGCTTCCAGTGTCACTGCCACTCTGGCAGGCCCTAGGTTCA  
AGTGAACACATCTCTTGGTCTCTTCTGGGTGCAAGGGAGTGTCTTCTCTTGTCTACTTGG  
GGAGAGCTGAGAGGGAAACAGGCCCTCCAGCTGTGGCAGCCTGCCAGGGAGCTGCC  
CACCAGTCCAGAACTGGTGTGGAAAGAAAGTCCACAGACATATCTCTTCTCCCTTGTCTGCC

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CTGGTCTGTGCCGAGTCTGCAGGGGCCCATCCTCACTGGAGAGGCAGTATCACTGCAGATAGTCACGGGGAGGCTCTGGAGGTCTCACAGGAAGGACAGGCCTTGGCCAGCACAGAGCAGAGGTTGTCAGGGTAGGCTCGCAGAGTGTGACCTGTGGGCCCTCAGCTGACACCGTGACTGCTCCTCCAGAACAGTTGCTGACCCCTCCCTGTCCGTGAGCTGGACATGGCTTCATTGTTCAATGAACACTCGGAGTGGTTCTCCA CGGTTGATGTCGTGTTGGTAGAAAGCCCCCTTCCTTACAATCTTCTGGAGGTGCTCCCCTTCTA GAAGGATTGCCATTGAACAGTAGACATGTGGTGTGGCAGGTGACTGGAGTTGAGAGATCAACACTTG AGAGTTTCTGTCATCCCCAGTGGCACAGGACAGGGCTGTGCCACAAATGCAACAAATTGCTGTCCCCAG AGTGGGCTCATGACTGCCCACTCATACGGAGCCCTGTAGATGAAATACCTGATCAGCTTCCCTCTATAACCTGGAAAAGTTGTGAGGGCTAAGGCTCAGTGTAGGGAAATTGTTAGAGCTGCCACTCCT GTGCTCCCCCTGTCCCCATCACCTCTTCTGGAGTCTGAGGACTGAGCCAGTTACGCCACTGCAGGAT GTTCAATCTGGTCTGGCCGTCTGGTGGCCCTGGAACTTGAGCAGACACAGGTGCAAGGAGTGGTGAECTAC TACAGGCCCTGTCAATTCCGGCCCTTTGCAACGTTGTGGCAACAAATAAATTGACGTAGCCATCCTC CATTGGAACTGTGGTGGCTGGTTGCCGTGAAATGACCCGTGTTTATTCAGAAATTACCTCTGGTT TAGAGAAAGTGGTTTAAACGAGTGTGGTAAAAAAATTACCTGAGGTACTGTCAAGATCGCAGACTT CTAGGTCCCACCCAGCTCTCATCAATCAGTTAGTGGAGGTGGTCCCAGGACTCTGATTAAACATAC CCCTAGAAAAGATTCTGATACAGTAGAGGTGAGAACGCCCTGGTTAGAAGCAGCTCGGCCCTCCCTCATG GTGGGACCAGGGCCAGAGGAATGTCAGGGCCACCCCTGACCTTCACTGTGACTCTGTCAGAGGGTG GCCTGGAGGAGATGGTGGAGGAGCTCAACAGCGGGAAAGGTGATGTACGCCCTCTGCAAGAGTAAGGACCC CAAACTTGGACTGCCAAATTGTCCTCATCAACTGGACAGCGAGGGCGTGAACGATGTGGCAAGGGGA GCTGTGCCAGCCACGTCAAGCACCATTGCCAGCTTCTGAAAGGGGCCATGTGACCATCAACGACGGG CCGAGGAGGATGTGGAGGCTGATGTGACATGGAGAAGGTGGCCAAGGCTTCAAGGTGCAACTACAGCTT TCACAAGGAGAGATGGCCCTTCAGGACGTGGAGCCCCCAGGCCAGTGGCTCTGTGACCGAGAACG ACCATGGCTGTGAGATTAAAGGGTTGGTAAAGACAGCTCTGGCAAAGCAGAGGTGAGTGTGCC CCGGGCATGCTGGCACGTGGAGTGTCTGTTGCTCATCTTCCACAAAGTGAGCTCATGC AGCATCAACTCTCTTGGTGCCTTACAGATGGTCACACTGAGGCTGGGTAAGTTAACGCCACAAGGCT AATGATCGACTGGCTCTGGTGCCTTGGCCATGTGCCCTAAACTCAGTCTGGCAGGGATTAGG CTGAAGTGGCAGCATAGGGCTGAGCGGGCAGTGGCTCTCCCTGCAAGAGGAGGAGAACCGTCGGTG GAGGAAAAGCGCGGGCCGAGGAGGACAGCGGCAGCTGGAGCAGGAGCGCCGGAGCGTGTGAGCTCGTG AGGCTGACGCCGGAGCAGCGCTATCAGGAGCAGGGTGGCAGGCCAGCCCCCAGAGGACGTGGGAGCA GCAGCAAGAAGTGGTTCAAGGAACCGAAATGAGCAGGAGCTGCCGTGCACCCAGGGAGATTTCAGA CAGAAGGAGAGGGCATGTCCACCCACCTCCATCTCCAGTCTCAGCTGGCAAGCTGAGGAGCCCCCTCC TGCAGAACAGCTACCCAAACAGAGACCCACTTGGCAGAGGAGCAGCTGCCATCTGAGGAGGCCAG GGCAGATCTCTCTGTGAGGAGGCCGGCCAGCAGCTCTCCATGTCTGGCAGGCCAGAGGAGCT GTGTATGAGGAACCTCCAGAGCAGGAGACCTCTACAGGAGCTGCCAGTGGCAGCACAGGTGCTG GCTCTGAGCACATTGACCACATTCAAGGGCCAGGGCTCAGTGGCAAGGGCTCTGCCCCGTGCCCT GTACGACTACCAGGCAGCCGACGACAGAGATCTCTTGGCCAGAACCTCATCACGGGCATCGAG GTGATCGACGAAGGCTGGTGGCGTGGCTATGGGCCGATGGCATTGGCATGTTCCCTGCCACTACG TGGAGCTCATTGAGTGAGGCTGAGGGCACATCTGCCCTTCCCTCTCAGACATGGCTTCTTATTGCTG GAAGAGGAGGCTGGAGGTTGACATTCACTCTCCAGGAATAGGACCCCCAGTGAGGATGAGGCCCTC AGGGCTCCCTCCGGCTGGCAGACTCAGCTGTACCCCAAATGCAGCAATGGCTGGTATTCCACAC ATCCTTCTGACCCCCGACCCCTCCAGACAGCTGGCTTGGCCATGGCCACAGGACTATGGCAACGCC CTGCTGTGGCAAGCCCTGAGTGGCACTGCCAACGCTGCCAGGGAGGGTCTGAGCAGGGCATCTGGG AGGCTCTGGTGTGCCCTCTGCAATTATTGCTTTTCTCTCTGCTTCAAGGGTGGTGGCCAC CACTGTTAGAATGACCCCTGGAAACAGTGAACCTGAGAATTTGTTAGAGCTTGTGAGGTTGACCAAAGT CAGAGTGGATCATGGTGGTTGGCAGCAGGGAAATTGCTTGTGGAGGCCCTGCTGTGCTCCCCACTCC ATTCTCTGTCCTCTGCCCTGGCTATGGGAAGTGGGATGCAAGATGCCAACGCTCCACCCCTGGTATT CAAAAACGGCAGACAAACATGTTCCCTCACGCCGCTCACTCGATGCCGTGAGGCCAGTGTCAGCTC AACTGATTCTGACTCAGGAAAAGTAACACAGAGTGGCAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAA

Human HIP-55 protein sequence - var1 (public gi: 21619483) (SEQ ID NO: 390)  
MAANLSRNGPALQEAYVRVVTEKSPTDWALFTYEGNSNDIRVAGTGEGGLEEMVEELNSGVYAFCRVK  
DPNSGLPKFVLINWTGEGVNVDVRKGACASHVSTMASFLKGAHVTINARAEEDVEPECIMEKVAKASGANY  
SPHKESGRFQDVGPQAPVGSVYQKTNAVSEIKRGKDSFWAKAEKEEENRRLEEKRRAEAQRQLEQERR  
EREELREAAARRQRYQEQQGEASPORTWEQQEVVSNRNEQESAVHPREIFKQKERAMSTTSISSLPGPK  
LRSPPFLQQLTQPETHGREPAAAISRPRADLPAAEPAPSTPPCLVQAEEEAVIDEYEPPEQETFYEQPPLV  
QQQGAGSEHIDHHIQQGLSGQGLCARALYDYQAADDTEISFDPENLITGIEVIDEGWWRGYGPDGHFGM  
EPANYVELIE

Human HIP-55 protein sequence - var2 (public gi: 15079723) (SEQ ID NO: 391)  
MAANL5RNGPALQEAYVRVVTESPTDWAFLTYEGNSNDIRVAGTGEGGLEEMVEELNSGKVMYAFCRVK  
DPNSGLPKEVLINWTGEGVNDRKGACASHVSTMASEFLKGAHVTINARAEEEDVEPECIMEKVAKASGANY

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SFHKESGRFQDVGQPQAPVGSVYQKTNAVSEIKRKGDSFWAKAEKEEENRRLEEKRRRAEEAQRQLEQERR  
ERELREAARREQRYQEQQGEASPQSRWEQQEVNSRNRNEQESAVHPREIFKQKERAMSTTSISSPQPG  
KLRSPLQKQLTQPETHFGREPAAAISRPRADLPAAEPAPSTPPCLVQAEEEAVYEEPPEQETFYEQPPL  
VQQQGAGSEHIDHHIQQQGLSGQGLCARALYDYQAADDTEISFDOPENLITGIEVIDEGWWRGYGPDMHFG  
MFPMFVVELIE

Human HIP-55 protein sequence - var3 (public gi: 14041996) (SEQ ID NO: 392)  
MAANLSRNGPALQEAYVRVVTTEKSPTDWALFTYEGNSNDIRVAGTGEGGLEEMVEELNSGKVMYAFCRVK  
DPNSGLPKFVLINWTGEGVNDVRKGACASHVSTMASFLKGAGHTINARAEEEDVEPECIMEKVAKASGANY  
SFHKESGRFQDVGQPQAPVGSVYQKTNAVSEIKRKGDSFWAKAEKEEENRRLEEKRRRAEEAQRQLEQERR  
ERELREAARREQRYQEQQGEASPQSRWEQQEVNSRNRNEQGSTCASLQESAVHPREIFKQKERAMSTT  
SISSPQPGKLRSPLQKQLTQPETHFGREPAAAISRPRADLPAAEPAPSTPPCLVQAEEEAVYEEPPEQE  
TFYEQPPLVQQQGAGSEHIDHHIQQQGLSGQGLCARALYDYQAADDTEISFDOPENLITGIEVIDEGWWRG  
YGPDMHFGMFPANYVELIE

Human HIP-55 protein sequence - var4 (public gi: 10441970) (SEQ ID NO: 393)  
MEKVAKASGANYSFHKESGRFQDVGQPQAPVGSVYQKTNAVSEIKRKGDSFWAKAEKEEENRRLEEKRR  
EEAQRQLEQERREREELREAARRREQRYQEQQGEASPQRTWEQQEVNSRNRNEQESAVHPREIFKQKERAM  
STTSISSPQPGKLRSPLQKQLTQPETHFGREPAAAISRPRADLPAAEPAPSTPPCLVQAEEEAVYEEPP  
EQETFYEQPPLVQQQGAGSEHIDHHIQQQGLSGQGLCARALYDYQAADDTEISFDOPENLITGIEVIDEGW  
WRGYGPDMHFGMFPANYVELIE

Human HIP-55 protein sequence - var5 (public gi: 10121215) (SEQ ID NO: 394)  
MAANLSRNGPALQEAYVRVVTTEKSPTDWALFTYEGNSNDIRVAGTGEGGLEEMVEELNSGKVMYAFCRVK  
DPNSGLPKFVLINWTGEGVNDVRKGACSSHVSTMASFLKGAGHTINARAEEEDVEPECIMEKVAKASGANY  
.SFHKESGRFQDVGQPQAPVGSVYQKTNAVSEIKRKGDSFWAKAEKEEENRRLEEKRRRAEEAQRQLEQERR  
ERELREAARREQRYQEQQGEASPQSTWEQQEVNSRNRNEQESAVHPREIFKQKERAMSTTSISSPQPGK  
LRSPFLQKQLTQPETHFGREPAAAISRPRADLPAAEPAPSTPPCLVQAEEEAVYEEPPEQETFYEQPPLV  
QQQGAGSEHIDHHIQQQGLSGQGLCARALYDYQAADDTEISFDOPENLITGIEVIDEGWWRGYGPDMHFGM  
FPANYVELIE